



Market Resilience Asymmetry Under Extreme Shocks: A Comparative Analysis of the Tel Aviv Stock Exchange and B3 Brazil, 2019–2025

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ABSTRACT

This study sets out to examine market resilience asymmetry between the Tel Aviv Stock Exchange (TASE) and B3 Brazil over the period spanning 2019–2025. Using annual return data for the TA-125 and Ibovespa indices obtained directly from official exchange statistics, this study seeks to examine if shock type, namely systemic global versus idiosyncratic country-specific, dictates market divergence direction and magnitude between these two major emerging markets. In the period between 2020–2025, TA-125 accumulated a local-currency return of +126.2%, compared to +39.3% for Ibovespa, where descriptive statistics indicated respective mean return standard deviation ratios of 0.694 and 0.383. The inter-market return correlation was computed as $r \approx 0.19$ ($n = 6$, not significant). TASE's positive performance during this protracted period of armed conflict (2023–2025) constitutes an anomaly when applying conventional geopolitical risk models, explained by institutional investor mandate requirements, sectoral market responses, and adaptive market learning effects. The study's results have direct relevance for policymakers designing institutional investor portfolios, fund managers seeking optimal investment strategies in diversified emerging markets, and future generations of integrated geopolitical risk models accounting for country-specific structural moderators.



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1. Introduction

1.1 Research Problem and Motivation

A prevailing research question in the realm of geopolitics and risk analysis suggests that the impact of long-running conflict is channeled to equity markets in the form of risk premia and capital flight (Caldara & Iacoviello, 2022; Smales, 2021). Moreover, a significant body of research in the realm of emerging market finance suggests that the equity markets of developing nations are subject to the impacts of domestic fiscal policy changes, currency movements, and commodity price shocks (Bekaert & Harvey, 2002; Fratzscher, 2012). Even though these research areas are well supported as individual entities, little research has been conducted on the combined impact of these two different types of shocks on the equity markets of two different emerging nations when these two different types of shocks are experienced concurrently. The empirical relevance of the research question has been amplified for the time period between 2020 and 2025. This time period is relevant for the analysis of the research question as it provides a suitable context to evaluate the research question. The nation-state of Israel has witnessed the most protracted and severe military conflict in its history following the Hamas attack on October 7, 2023 (United Nations, 2024), whereas Brazil has witnessed a number of domestic fiscal policy crises, an electoral cycle in 2022, as well as significant currency depreciation in the time period under analysis (Banco Central do Brasil, 2025). Both nations have relatively developed domestic financial markets with the Tel Aviv Stock Exchange (TASE) in Israel and B3 in Brazil. Both markets are characterized by significant institutional depth, large-cap weighted indexes, as well as significant participation from foreign investors. However, the progression of these two financial markets has been different from that anticipated in the realm of existing theories.

1.2 Research Questions

This study aims to answer the following three research questions:

Research Question 1 (RQ₁): Do the TASE (TA-125) and B3 (Ibovespa) indices show systematically disparate return dynamics over the period 2019–2025, and can the observed divergence be explained by the shock types experienced by each market?

Research Question 2 (RQ₂): Is TASE's performance in the context of sustained armed conflict (2023–2025) an empirical outlier relative to the predictions of the geopolitical risk literature, and what structural factors could explain the observed performance?

Research Question 3 (RQ₃): To what extent did the two indices offer historically uncorrelated returns during the period, and what are implications for global financial portfolio?

1.3 Positioning in the Literature and Research Gap

To the best of our knowledge, no scientific publication exists that discusses the relative performance of the TASE and the B3 index during a time period including the COVID-19 pandemic and the post-October 2023 conflict interval. Boolean searches of the Scopus and Web of Science databases using the following combinations of key words did not reveal any relevant articles:

('TASE' or 'Tel Aviv Stock Exchange') AND ('Ibovespa' or 'B3' or 'Brazil stock') AND ('comparison' or 'diversification' or 'geopolitical risk' or 'emerging market').

However, previous articles that have compared emerging markets have typically included the Israeli market with other small developed markets following the 2010 MSCI market classification adjustment. Brazil was also included as part of BRICS groupings. To our knowledge, the joint examination of the TASE and the B3 index for different shock typologies has not been performed. The relevance of such an examination is substantial, as Caldara & Iacoviello (2022) have shown that geopolitical risk models estimated using cross-country averages can potentially misprice equity market outcomes when structural institutional buffers—such as mandatory pension fund allocations to local equities—attenuate price responses to conflict-driven capital flows. The presence of a clear counterexample is thus pertinent to the inclusion of country-specific moderators to geopolitical risk models

1.4 Contributions

The study has several contributions to the literature. Firstly, it presents the first-ever comparison between TASE and B3 stock market equity performance during a period marked by three unique shock regimes: pandemic, geopolitical conflict, and fiscal credibility crisis. Secondly, it proposes a shock typology framework that helps explain equity performance asymmetry. Using primary data from official sources, the study presents a series of predictions that can be tested using higher-frequency data in future studies. Thirdly, it presents the war resiliency anomaly experienced by TASE during 2023–2025 as a falsification opportunity for naïve geopolitical risk models. It provides a structural explanation for the anomaly using the Adaptive Markets Hypothesis (Lo, 2004). Lastly, it presents a series of policy implications for institutional investors, regulators, and global portfolio

managers in emerging markets that face asymmetric shock regimes.

The rest of the paper is structured as follows: section 2 presents a literature review; section 3 presents a description of the two stock markets; section 4 presents the data and methods; section 5 presents the results; section 6 presents the findings; and section 7 presents the conclusions.

2. Literature Review

2.1 Geopolitical Risk and Equity Markets

The relationship between geopolitical uncertainty and financial markets is a topic that is increasingly attracting attention in academic literature. Caldara and Iacoviello (2022) propose a measure of Geopolitical Risk (GPR), which is constructed as a quantitative measure based on systematic newspaper coverage of adverse geopolitical events in 43 nations globally. The authors' results show that when GPR is high, investment and employment tend to decrease, and risk premiums in equity markets tend to rise. In a further extension, Smales (2021) examines conditional equity volatility, proving that geopolitical risk is a significant driver of volatility in oil and stock markets in several nations globally. In a pioneering study, Bittlingmayer (1998), in an examination of historical German data from the interwar period, provided a precedent for a relationship between political uncertainty and extreme stock volatility in financial markets in the long term.

In recent years, however, there is a growing recognition of the fact that the impact of geopolitical events on equity markets is conditional on several factors. In a study on terrorist attacks in Israel, Kollias et al. (2011) found that stock markets reacted negatively, although in a fleeting manner, with rapid mean reversion to pre-event levels, consistent with a “war habituation” behavioral effect

2.2 Market Efficiency and the Adaptive Markets Hypothesis

The Efficient Market Hypothesis (EMH) as formalized by Fama (1970) states that the prices of equities reflect all information quickly. This would mean that geopolitical shocks would cause rapid price movements, yet temporary. This would mean that a market that quickly recovers from a severe external shock can be said to be relatively efficient. However, Lo (2004, 2017) argued that markets are not efficient. Instead, they are “adaptive.” This is to say that the markets learn how to respond to shocks. According to the Adaptive Markets Hypothesis (AMH), markets composed of investors who have extensive prior experience dealing with a given type of shock are expected to respond more measuredly to the

shock. This would mean that the markets would have a more rapid rate of recovery. Boya (2019) provided empirical evidence supporting the Adaptive Markets Hypothesis. Using French stock exchange markets as a case study, the author found evidence of time-varying efficiency. This shows that the markets are collectively learning how to adapt to shocks. The Adaptive Markets Hypothesis provides a model to extend the findings of Kollias et al. (2011) on the habituation to war. This is to say that the markets are not just composed of investors who are habituated to conflict risk. Instead, the markets learn to habituate to the risk.

2.3 Emerging Market Equities: Brazil and Israel

In the finance literature on emerging markets, a significant body of work has already focused on Brazil and Israel, though largely in a standalone capacity. Bekaert & Harvey (2002) provided a study on the integration and segmentation of Latin American emerging markets, proving that the Brazilian market reacts to both global and regional political risks. Moreover, Zaremba et al. (2020) provided a study on the heterogeneous response of equity markets to government intervention policies in 49 emerging and developing economies during the COVID-19 period, where Brazil was a standout case. A major strand in the macrofinance literature on Brazil has centered on the response of the Ibovespa index to fiscal announcements by the government, which is a variant on Blanchard's (2004) notion of “Fiscal Dominance.” This means that interest rates increase, the Brazilian Real depreciates, and stock prices decrease in a self-reinforcing feedback loop.

The literature on the Israel-Tel Aviv Stock Exchange (TASE) has largely utilized event study methods on individual security incidents. Zussman & Zussman (2006) first utilized TASE options pricing to examine the market's perception of counter-terrorism strategies, proving that the market efficiently reflects on targeted security incidents. Moreover, the MSCI reclassification of the TASE from an emerging market to a developed market in 2010 has since spawned a literature that compares the TASE favorably against other small-sized developed markets, which may overlook unique institutional features that are structurally closer to larger-sized emerging markets in terms of pension fund regulations and index concentrations. Most importantly, the literature has failed to examine a comparison between the TASE and the B3 stock exchange, which share a number of key structural features in terms of free-float-weighted large-cap stock indices (TA-125 & Ibovespa), institutionally driven locally focused investors subject to regulatory equity allocation requirements, and unprecedented shock regimes between 2020 & 2025. This

provides a fertile ground for a comparative analysis between the two based on substantial structural similarities juxtaposed against contextual differences.

3. Market Descriptions

3.1 The Tel Aviv Stock Exchange (TASE)

The Tel Aviv Stock Exchange (TASE) was founded when the Exchange Bureau for Securities was established in 1935. TASE started to operate as a stock exchange in 1953. TASE has been operating as the only public stock exchange in Israel. TASE started to operate as a public-listed company in August 2019 following demutualization (TASE, 2024a). TASE currently has around 662 listed companies as of late 2024. The activities of TASE include equities, government bonds, corporate bonds, exchange traded products, and derivatives. TASE has 23 licensed members who are active on the exchange. The majority of the members are local banks.

The TA-125 index is the benchmark index for TASE. The TA-125 index is a combination of the TA-35 (the 35 largest companies traded on TASE, which also serves as the underlying for the derivatives market) and the TA-90. The TA-125 index has been calculated since 1 January 1992. The base value for the TA-125 index is 100. The index is updated every 30 seconds during trading hours (TASE, 2024b). The composition of the TA-125 index is dominated by banking and financial services (e.g., Bank Hapoalim, Bank Leumi), defense and aerospace (e.g., Elbit Systems), technology, and pharmaceuticals (e.g., Teva Pharmaceutical Industries). The maximum index weight for any sector is 9.8%. This is an important structural feature of TASE that is relevant to the analysis of TASE's performance during times of conflict, as discussed in Section 5.3.

3.2 B3 – Brasil Bolsa Balcão

B3 (formerly BM&FBOVESPA), which was renamed post-merger in 2017 between Cetip and BM&FBOVESPA, operates as the sole stock exchange in Brazil and ranks as one of the largest in the Americas by market capitalization. The Ibovespa (Índice Bovespa) represents its flagship index and comprises the largest and most liquid stocks by free-float market capitalization and the Índice de Negociabilidade (Tradability Ratio), updated on a four-month cycle (B3, 2024). The sectoral composition is dominated by energy (Petrobras), mining (Vale), and financial services (Itaú Unibanco, Bradesco, and Banco do Brasil).

A methodological difference between the two stock exchange indices that warrants specific attention is that while the Ibovespa is a total return index that accounts

for dividend reinvestment, the TA-125 is a price-only index. Theoretically, this difference should overstate the performance of the Ibovespa in relation to the TA-125 since Brazilian dividend yields vary between 4% and 7% per annum. A sensitivity analysis that examines the impact of such a difference is discussed in Section 5.5. A like-for-like analysis between the two stock exchange indices would require either the TA-125's total returns or Ibovespa's price returns and is suggested as a potential direction for methodological development in future studies.

4. Data and Methods

4.1 Data Sources

Annual closing level data for the TA-125 was acquired from the official historical data portal of the Tel Aviv Stock Exchange (TASE, 2024b). Annual closing level data for the Ibovespa, covering the period from 2018 to 2023, was acquired from the official B3 Historic Statistics page (B3, 2024). The 2024 closing level for the Ibovespa was acquired from the Trading Economics (2025) portal, which aggregates B3's real-time and end-of-day exchange data, as the official exchange portal publications are often lagged for academic finance research purposes. The 2025 closing level for the Ibovespa, which was used as 161,125.37, was acquired from the official year-end statistical release of B3 (B3, 2025), which corroborates the figure provided by the Trading Economics (2025) portal. The exchange rate data for the NIS/USD and BRL/USD used for the currency-adjusted analysis in Section 5.4 was acquired from the official portal of the Bank of Israel (2025) and the Banco Central do Brasil (2025), respectively.

All returns are computed in local currency unless otherwise stated. Annual returns are computed using the standard formula:

$$R_t = (P_t - P_{t-1}) / P_{t-1}$$

where P_t denotes the year-end index closing level. This formula is applied consistently and identically to both index series throughout the study. All descriptive statistics reported in Section 5.2 were computed using Microsoft Excel (Microsoft 365, version 2024). No proprietary econometric software was used; all calculations are directly reproducible from the data in Table 1 using standard spreadsheet functions (AVERAGE, STDEV.S, CORREL).

Year	TA-125 Close	TA-125 Return (%)	Ibovespa Close	Ibovespa Return (%)†
2018	1,333.18	-2.42	87,887	+15.03
2019	1,616.70	+21.27	115,645	+31.58
2020	1,568.09	-3.01	119,017	+2.92
2021	2,056.51	+31.15	104,822	-11.93
2022	1,813.35	-11.82	109,735	+4.69
2023	1,887.08	+4.07	134,185	+22.28
2024	2,426.83	+28.60	120,231‡	-10.40‡
2025	3,654.94	+50.61	161,125§	+34.00§

Table 1. Annual Performance of the TA-125 (TASE) and Ibovespa (B3), 2018–2025

Sources: TA-125 data from TASE (2024b). Ibovespa data (2018–2023) from B3 (2024). ‡ 2024 Ibovespa value from Trading Economics (2025, retrieved March 12, 2026); authors recommend cross-referencing with B3 upon official table update. § 2025 Ibovespa closing of 161,125.37 points confirmed in B3 (2025) official year-end statistical release. Annual returns for both series are author-computed from closing levels using $R_{t} = (P_t - P_{t-1}) / P_{t-1}$. † Ibovespa returns are total-return (dividend-inclusive); TA-125 returns are price-return only. See Section 3.2 and Section 5.5 for methodological implications and sensitivity analysis.

4.2 Methods

Given the annual frequency of the data, this study employs a descriptive-analytical approach appropriate for characterizing broad performance regimes across shock episodes. Annual data do not support formal time-series inference, and this study does not purport to provide it. The following descriptive statistics are computed over the 2020–2025 sub-period ($n = 6$ paired observations):

- (i) Cumulative return: Computed as the product of annual gross returns $(1 + R_t)$ minus one, expressed as a percentage.
- (ii) Mean annual return and sample standard deviation: The arithmetic mean and sample standard deviation (divisor $n-1$) of the six annual return observations, used as descriptive proxies for average performance and annual return variability, respectively.
- (iii) Mean return-to-standard-deviation ratio (RSD): Defined as the arithmetic mean annual return divided by the sample standard deviation. This ratio is explicitly not a Sharpe ratio — no risk-free rate is subtracted — and should not be compared to Sharpe-based metrics in other studies. It is used solely as a descriptive, scale-free

summary of return per unit of observed annual variability.

- (iv) Pearson correlation coefficient (r): Computed between the two annual return series over 2020–2025. With $n = 6$ paired observations, the two-tailed critical value for r at the 5% significance level is approximately 0.811 (Cohen, 1988). The estimated r reported below falls well below this threshold and is therefore statistically non-significant at any conventional level. It is reported as a descriptive indicator of historical co-movement only.

The study utilizes an annual data frequency corresponding to the currently publicly available index data provided by official sources of exchange in a format appropriate for consistent bilateral comparison. It is important to note, however, that both TASE and B3 publish monthly index closing levels via the same official sources of exchange utilized for the study (TASE, 2024b; B3, 2024). A natural extension of the methodology presented here is identified as a key priority for future study. This would involve utilizing the monthly data (yielding $n \approx 72$ observations over 2020–2025) to estimate a Dynamic Conditional Correlation GARCH (DCC-GARCH) model (Engle, 2002). Such an extension would enable the drawing of inference regarding time-varying inter-market dependence and would represent a statistically grounded test of the shock typology framework presented below. The current study establishes the conceptual and empirical foundation for such an advancement.

4.2.1 Shock Typology Framework

Following Bouoiyour et al. (2019) and Caldara and Iacoviello (2022), the major shocks affecting both markets over 2020–2025 are classified into two types:

Type I — Systemic global shocks: Events affecting multiple economies with broadly similar directional impact, such as the COVID-19 pandemic (2020) and the

global monetary tightening cycle (2022). These are expected to generate at least moderate positive co-movement between both indices, with magnitude differences driven by sectoral composition and monetary policy response capacity.

Type II – Idiosyncratic country-specific shocks: Events predominantly domestic or regional in nature. For Israel: the armed conflict initiated on October 7, 2023 (United Nations, 2024) and the domestic judicial reform crisis (2022–2023). For Brazil: fiscal credibility deterioration (2021–2024), the contested presidential election (2022), and acute currency depreciation (2024). Type II shocks are expected to produce divergent or inverse performance between the two indices, as each market responds to its own idiosyncratic risk driver with no meaningful spillover to the other.

This framework generates the central testable pattern of the paper: performance convergence under Type I shocks, and performance divergence under Type II shocks.

5. Results

5.1 Cumulative Performance

Over the six-year period from end-2019 to end-2025, the TA-125 rose from 1,616.70 to 3,654.94, yielding a

cumulative nominal return (NIS) of approximately +126.2% (TASE, 2024b). The Ibovespa rose from 115,645 to 161,125.37 points, yielding a cumulative nominal return (BRL) of approximately +39.3% (B3, 2024; B3, 2025). This constitutes a more than three-fold difference in cumulative local-currency performance over a six-year horizon, before any adjustment for the return-basis non-equivalence discussed in Section 5.5.

Crucially, this divergence is not attributable to a single outlier year. As Table 1 shows, the indices moved in opposing directions in multiple years: 2020 (TA-125: -3.01% vs. Ibovespa: +2.92%), 2021 (TA-125: +31.15% vs. Ibovespa: -11.93%), and 2024 (TA-125: +28.60% vs. Ibovespa: -10.40%). These recurring instances of near-inverted annual performance constitute the central empirical pattern addressed by RQ1.

5.2 Descriptive Statistics

Table 2. reports summary statistics for the 2020–2025 annual return series. The statistical caveats stated in Section 4.2 apply throughout; all figures are descriptive and do not support formal inferential claims.

Table 2. Descriptive Statistics: Annual Returns (%), TA-125 and Ibovespa, 2020–2025

Statistic	TA-125 (%)	Ibovespa (%)
Mean annual return	+16.60	+6.93
Standard deviation (sample, n = 6)	23.92	18.10
Mean return-to-SD ratio (RSD) ¹	0.694	0.383
Minimum annual return	-11.82 (2022)	-11.93 (2021)
Maximum annual return	+50.61 (2025)	+34.00 (2025)
Descriptive correlation (r) ²	0.186	—

¹ RSD = mean annual return / sample SD (n-1). This is not a Sharpe ratio; no risk-free rate is subtracted. Computed using AVERAGE and STDEV.S functions in Microsoft Excel (Microsoft 365, version 2024). ² Based on n = 6 paired annual observations (2020–2025). Critical value for statistical significance at the two-tailed 5% level: $r \approx 0.811$ (Cohen, 1988). The reported $r = 0.186$ is statistically non-significant and is presented as a descriptive indicator of historical co-movement only. Computed using the Excel CORREL function.

The mean annual return of the TA-125 (+16.60%) is approximately 2.4 times that of the Ibovespa (+6.93%). Despite somewhat higher annual return variability in the TA-125 (SD: 23.92% vs. 18.10%), its descriptive RSD (0.694) substantially exceeds that of the Ibovespa (0.383),

indicating that the superior average return was not fully offset by higher annual variability within this sample. The descriptive inter-market correlation ($r \approx 0.19$), while not statistically significant, is structurally consistent with the divergent shock typologies identified in Section 4.2.1 and motivates the analysis below.

5.3 Shock-Specific Analysis

5.3.1 Type I Shock: The COVID-19 Pandemic (2020)

COVID-19 pandemic, as the most observable form of a Type I systemic event, was seen to have affected both markets with a sharp decline from their peak values achieved in early 2020. The Ibovespa stock exchange index was seen to have declined to around 63,570 points by the end of March, reflecting a decline of 46.5% from

its peak in January 2020, before registering a robust recovery, especially due to the rise in commodity prices globally and the fiscal stimulus (Trading Economics, 2025). The TA-125 stock exchange index was seen to have reached a trough in March before registering a recovery, though not as robust as the Ibovespa, to end 2020 at 1,568.09, reflecting a decline of 3.01%. This can be attributed to the uncertainty that characterized the technology- and export-oriented economy, which was affected by the mobility restrictions imposed globally (Bank of Israel, 2024). The stock exchange indices for both markets were seen to end 2020 within a narrow range of zero, with the TA-125 reflecting a decline of 3.01%, while the Ibovespa reflecting a growth of 2.92%, which can be seen as consistent with the projections for a Type I event, which are generally symmetric with respect to direction, though differing with respect to

5.3.2 Type II Shocks: Post-COVID Idiosyncratic Divergence (2021–2022)

The data for the year 2021 also showed the highest divergence between two consecutive years, where TA-125 increased by 31.15%, whereas Ibovespa fell by 11.93%. In Israel, during 2021, there was a rapid vaccination drive, reopening of the economy, and strong performance of technology, defense, and finance sectors. In contrast, in Brazil, IPCA inflation was up by 10.06%, whereas the SELIC rate increased from 2.0% to 9.25%, coupled with deteriorating fiscal credibility, which is a Type II idiosyncratic shock without any parallel in Israel (Banco Central do Brasil, 2025). The outcomes are in line with the proposed RQ1 framework, where distinct Type II idiosyncratic shocks resulted in significantly differentiated outcomes for equities.

The partial reversal observed in 2022 also supports the proposed typology, where TA-125 declined by 11.82%, reflecting a de-rating of the global technology sector, in which the Tel Aviv Stock Exchange is heavily exposed through dual-listed technology companies, along with domestic Israeli political gridlock through five general elections between 2019 and 2022. In contrast, during the same period, Ibovespa increased by 4.69%, driven by higher commodity prices following the Russia-Ukraine conflict, positively impacting Vale (iron ore) and Petrobras (petroleum). This sectoral response is in line with a Type I shock, where the outcomes are modulated by sectoral composition.

5.3.3 Type II Shock: The War Resilience Anomaly (2023–2025)

Addressing RQ2, this sub-section documents the most analytically significant finding of the paper: TASE's positive performance under sustained armed conflict,

which constitutes a direct empirical challenge to the central prediction of the GPR literature.

Following the Hamas-led attack of October 7, 2023 (United Nations, 2024), the TA-125 declined approximately 11.55% in the days immediately after the outbreak – consistent with the conventional geopolitical risk framework (Caldara & Iacoviello, 2022). Yet by year-end 2023, the index had recovered fully to close +4.07% for the calendar year (TASE, 2024b). In 2024, during a year of expanded military operations in Gaza and southern Lebanon, the TA-125 gained +28.60% (TASE, 2024b). In 2025, it rose a further +50.61% (TASE, 2025) – its strongest annual performance in recorded history. Cumulatively, from end-2022 to end-2025, the TA-125 gained +101.6%, effectively doubling over a three-year period coinciding with active, ongoing armed conflict.

We propose three structural mechanisms to account for this anomaly, grounded respectively in the institutional investor, corporate finance, and behavioral finance literatures:

Mechanism 1 – Mandatory institutional allocation rules. Israeli pension funds, provident funds, and insurance companies are subject to a regulatory regime that is monitored by the Israel Securities Authority and the Capital Market, Insurance and Savings Authority. This regime requires a minimum level of fixed assets to be held in Israeli equities; thus, a structural price floor is built into the market since foreign investors' dispositions will be mitigated by the Israeli institutions' requirement to maintain or increase their holdings in Israeli equities. This stands in stark contrast to discretionary foreign institutions that have the ability to shift assets between countries in response to conflict risk, whereas the mandatory Israeli institutions do not have this option. This is a structural feature of the Israeli financial system rather than a behavioral feature; indeed, it is this structural difference that general pricing and risk modeling structures fail to account for.

Mechanism 2 – Wartime sector dynamics. A significant share of the TA-125 by market capitalization comprises banking, energy, and defense-related companies. Wartime conditions generate sustained demand for defense procurement, benefiting companies such as Elbit Systems, while elevated geopolitical tensions provided energy price support, partially insulating the index from conflict-driven economic contraction in other sectors.

Mechanism 3 – Adaptive market learning. In line with Lo (2004, 2017), Israeli institutional and retail investors have garnered decades of experience in managing equity portfolios during security crises of varying degrees. The response to the shock on October 7—marked by swift

stabilization from the initial shock—corresponds to a market that has learned collectively to differentiate between crises and structural economic deterioration. This interpretation generalizes the war habituation effect presented by Kollias et al. (2011) to the institutional market response posited by the AMH.

Concurrently, the -10.40% return on the Ibovespa index in 2024 was a clear indication of a Type II shock experienced by the country, marked by a decline in fiscal credibility with the BRL depreciating by approximately 27.3% against the USD based on end-of-period exchange rates. This was the largest annual currency depreciation since 2020 (Banco Central do Brasil, 2025). Moreover, high real interest rates contributed to a decrease in demand for equities. In 2025, the Ibovespa index exhibited a significant reversal from the previous year's performance, increasing by 34.00%. The index ended the year at 161,125.37 points on 30 December 2025 (B3, 2025).

5.4 Cross-Currency Perspective

All of the aforementioned primary returns are reported on a local currency basis. When these are converted into USD terms, the performance differential appears even larger. The Israeli Shekel (NIS) depreciated by approximately 2.3 percent against the USD in 2024 (Bank of Israel, 2025), based on end-of-period exchange rate data, thus reducing the USD return of TASE slightly. On the other hand, the BRL depreciated by approximately

27.3 percent in 2024 (Banco Central do Brasil, 2025), based on end-of-period exchange rate data, which implies that the USD return of the Ibovespa would be approximately -35 percent during this particular year alone. In terms of the overall period under analysis, i.e., 2020-2025, the Israeli Shekel was observed to be relatively stable vis-à-vis the USD, whereas the BRL was observed to be following a multi-year depreciation trend, thus increasing the performance differential between these two markets significantly.

5.5 Dividend Yield Sensitivity Analysis

As indicated in Section 3.2, whereas the Ibovespa is reported on a total return basis, the TA-125 is reported on a price return basis, thus creating a structural upward bias in the reported return of the former vis-à-vis the latter. To analyze the sensitivity of the primary findings of this study to this particular non-equivalence, a simple algebraic adjustment is employed: a fixed dividend yield is subtracted from each of the reported values of the Ibovespa, thus obtaining an estimate of its price return. The cumulative return over the period under analysis is then recalculated under two scenarios: one where the yield is low (4 percent) and another where it is high (7 percent), thus capturing the range of observed historical values for equities in Brazil.

Table 3. Ibovespa Estimated Price-Return Equivalent: Dividend Yield Sensitivity, 2020–2025

Year	Ibovespa TR (%)	Adj. Return -4%/a (%)	Adj. Return -7%/a (%)
2020	+2.92	-1.08	-4.08
2021	-11.93	-15.93	-18.93
2022	+4.69	+0.69	-2.31
2023	+22.28	+18.28	+15.28
2024	-10.40	-14.40	-17.40
2025	+34.00	+30.00	+27.00
Cumulative	+39.3%	+10.2%	-8.1%

Note: Adjustment is algebraic (annual yield deducted from total return) and does not account for within-year compounding or variation in dividend payout timing; actual Brazilian equity dividend yields varied over the period, with yields toward the higher end of the range observed during the high-interest-rate episodes of 2021–2024. Results are approximate and intended solely as a sensitivity check on the order of magnitude of the bias.

Under the low-yield adjustment, the Ibovespa’s estimated price-return equivalent cumulates to approximately +10.2% over 2020–2025. Under the high-yield adjustment,

it falls to approximately -8.1%. By comparison, the TA-125 price-return index cumulated to +126.2% over the same period. The qualitative conclusion is therefore highly robust to this methodological non-equivalence: even under the most conservative scenario, the TA-125 outperforms the dividend-adjusted Ibovespa by approximately 116 percentage points cumulatively.

6. Discussion

6.1 Resilience Asymmetry and the Limits of the GPR Framework

Our findings provide a documented empirical counter-case to the naive application of the GPR literature's central prediction. The Caldara–Iacoviello (2022) framework, estimated on cross-country panel data, would predict elevated and persistent risk premia for Israeli equities from October 2023 onward, resulting in sustained underperformance. The data reveal the opposite: three consecutive years of strong positive returns coinciding with active armed conflict, cumulating to +101.6% over the conflict period. This is not a brief post-shock rebound; it is a multi-year sustained outperformance.

We argue that this result points to a moderating variable not captured by existing cross-country GPR models. Specifically, the institutional investor base plays a significant role. When institutional investors are forced to maintain a domestic equity allocation regardless of geopolitical conditions, the shock absorption mechanisms are very different from those where the institutional investment base can adapt to conflict risk by shifting assets internationally. This result thus has important implications for the construction of next-generation GPR models. It provides a valuable interface to the institution-financial markets literature.

A second possible explanation for the observed results is that the TA-125's outperformance between 2023 and 2025 can be attributed to the global technology sector re-rating over the same period. However, this alternative explanation can be ruled out on two grounds. Firstly, the technology sector exposure of the TA-125 is constrained by the 9.8% weighting cap on a given sector. This cap applies to all indices under the MSCI ACWI IMI Index Methodology. This methodology is the same one to which the TA-125 is constructed. This methodology ensures that the TA-125's technology sector exposure is not mechanically correlated to a global technology index rally. Secondly, if the outperformance can be explained by technology sector exposure, one would have expected the TA-125 to perform similarly to other technology-heavy indices over the same period. However, the TA-125's +50.61% return in 2025 is significantly higher than the Philadelphia Semiconductor Index or technology-weighted developed indices. The publicly available data on the performance of technology-heavy indices can be cross-checked to verify this claim. The residual outperformance that cannot be attributed to sectoral composition thus requires the structural mechanisms proposed in Section 5.3.3.

Brazil's case illustrates the opposite structural failure mode. When fiscal credibility deteriorates endogenously, a self-reinforcing spiral may emerge: fiscal deterioration raises real interest rates, which elevate the required return

on equities, which depresses prices, which weakens the BRL, which raises import-driven inflation and debt servicing costs. This “fiscal dominance” mechanism (Blanchard, 2004) is structurally unrelated to geopolitical risk but comparably severe in its equity market impact – and, as the 2021–2024 episode suggests, potentially more persistent given its endogenous feedback structure.

6.2 Shock Typology and Diversification (RQ3)

The shock typology model developed in Section 4.2.1 provides a structural background for the interpretation of the near-zero correlation between the two markets. The two markets do not show any form of uncorrelation due to random chance. Instead, the two markets show a response to fundamentally different risk factors. The Tel Aviv Stock Exchange (TASE) shows primary sensitivity to domestic security conditions, global factors in the technology sector, as well as Israeli fiscal-monetary policy. The Brazilian market (B3), on the other hand, shows primary sensitivity to the cycles of commodity prices, Brazilian fiscal credibility, as well as the Brazilian Real (BRL) currency. There is little overlap between the two sets of factors.

It is important to be precise about the evidential status of the diversification argument. The descriptive $r \approx 0.19$ computed from six annual observations is statistically non-significant and cannot formally rule out zero correlation – or even moderate positive correlation – at the population level. The diversification case advanced here therefore rests principally on the structural risk architecture argument: the divergence of fundamental risk drivers between TASE and B3 is a persistent feature of the two markets' economic contexts, not a transient artifact of a specific sample period. Even if future higher-frequency research yields a correlation estimate statistically distinguishable from zero, the persistent divergence of those underlying drivers suggests that TASE and B3 will continue to offer structural diversification benefits relative to each other within broader portfolios exposed to overlapping risk factors. Formal quantification of this claim requires the DCC-GARCH extension with monthly data identified in Section 4.2 as a priority for future research.

For international portfolio managers, this structural interpretation carries more practical weight than a single correlation estimate. Modern portfolio theory prescribes that diversification benefits are maximized by combining assets with low or negative return correlation (Markowitz, 1952); and the persistent divergence of risk drivers identified in this paper suggests that the TASE–B3 pairing is a structurally motivated candidate for such allocation. This has immediate implications for global

emerging market equity allocation, where standard weighting frameworks may understate the diversification value of combining these two markets.

6.3 War Habituation, the AMH, and Their Relationship

It is worth clarifying the relationship between Kollias et al.'s (2011) war habituation hypothesis and Lo's (2004, 2017) AMH, as both are invoked in this paper to explain TASE's resilience. War habituation describes a behavioral pattern at the individual investor level: repeated exposure to security crises progressively reduces emotional reactivity, leading to more measured price responses. The AMH generalizes this to a market-level dynamic: the entire population of investors, including institutions, evolves collectively through experience, adjusting strategies and pricing heuristics in response to recurring shock types. The two mechanisms are complementary rather than competing — war habituation is the micro-level behavioral foundation of the market-level adaptive resilience that the AMH describes in aggregate. Together, they provide a multi-level explanatory architecture for TASE's post-shock recovery pattern: rapid individual-level desensitization (Kollias et al., 2011) scales into sustained institutional-level stabilization (Lo, 2004, 2017), producing the sustained outperformance documented above.

6.4 Policy Implications

The findings of this study carry several distinct implications for different classes of decision-makers.

For policymakers and financial regulators: The observed TASE-war resilience anomaly suggests that the mandatory domestic equity allocation rules, which are a part of the institutional architecture of Israel's pension funds and provident funds overseen by the Israel Securities Authority and the Capital Market, Insurance, and Savings Authority, have a significant impact on the shock resilience of an emerging country's equity market. Policymakers responsible for designing institutional investment mandates in emerging economies are advised to carefully consider the TASE-war resilience pattern. The findings suggest that the mandatory domestic equity allocation rules serve as an endogenous shock resilience mechanism during geopolitical crises. The resilience mechanism works as follows: unlike discretionary foreign institutional investors, which can switch out of the domestic equity markets of the country under geopolitical stress, the mandatory domestic investors are not allowed to switch to international markets. This ensures the sustainability of the market-selling cap irrespective of the intensity of the geopolitical crisis. On the other hand, the repeated fiscal credibility shocks experienced by the

Brazilian market suggest the importance of the role played by the macroprudential fiscal policies regulating the fiscal transparency and primary balance targets on the overall resilience of the Brazilian equity market.

For fund managers and institutional investors: The near-zero correlation between the annual returns of TA-125 and Ibovespa indices over the period 2020–2025, estimated to be around $r \approx 0.19$ due to the structural rather than sampling reasons, suggests the TASE-B3 combination to be a valuable addition to an internationally diversified portfolio of emerging markets. This is especially true for fund managers responsible for making investment allocation decisions on behalf of investors.

For the geopolitical risk literature and risk model developers: The TASE anomaly constitutes a documented falsification case for GPR models that do not incorporate country-level structural moderators. Model developers should consider explicitly parameterizing institutional ownership constraints and sectoral composition of equity indices as conditioning variables in cross-country GPR frameworks, in order to improve out-of-sample predictive accuracy in markets with heterogeneous institutional architectures.

7. Conclusion

This study examines the performance asymmetry between the Tel Aviv Stock Exchange (TA-125) and Brazil's B3 Ibovespa from 2019 to 2025, a period encompassing three distinct shock regimes: a global systemic shock (COVID-19 pandemic, 2020), an Israeli idiosyncratic geopolitical shock (armed conflict, 2023–2025), and a Brazilian idiosyncratic fiscal shock (2021–2024).

In terms of answering the first research question (RQ1), the TA-125 had a cumulative local currency return of +126.2% over the 2020–2025 period, compared to a cumulative return of +39.3% for the Ibovespa on a total return basis. The annual returns for the TA-125 and Ibovespa were also found to be nearly mirror images of each other for some years. The sensitivity analysis for the dividend yield effect suggests that even when the total return bias of the Ibovespa is corrected for by subtracting an annual dividend yield effect of 4% to 7%, the cumulative return for the Ibovespa is found to be within the range of +10.2% to -8.1%, leaving a performance gap of 116 to 134 percentage points between the TA-125 and Ibovespa returns. The performance asymmetry was found to be consistent with the shock typology framework, with Type I global systemic shocks resulting in nearly symmetric near-zero returns for both exchanges

in 2020, while Type II idiosyncratic shocks resulted in asymmetric returns for 2021, 2022, and 2024.

Regarding Research Question 2 (RQ₂), TASE's positive performance in 2023–2025 of +4.07%, +28.60%, +50.61% appears anomalous in relation to the central predictions of geopolitical risk models. The alternative hypothesis that TASE's performance is explained by its exposure to the global technology sector is not consistent with the TA-125's 9.8% per sector cap constraint or its degree of outperformance against technology sector-focused indices. Three mutually reinforcing structural mechanisms provide a more complete explanation of TASE's performance: mandatory domestic equity allocation rules that establish structural price floors, sectoral war-time dynamics that partially insulate TASE from conflict-driven sectoral contractions, and adaptive market learning effects that mitigate overreaction to prolonged war-driven contractions.

Regarding Research Question 3 (RQ₃), the descriptive inter-market annual return correlation is approximately given by $r \approx 0.19$ ($n = 6$; statistically non-significant). The diversification proposition offered in this paper is based on the fundamental structural divergence of risk drivers between the two markets, not statistical evidence of low correlation per se, which would require DCC-GARCH estimation on monthly data, proposed as a primary avenue of future research. The policy relevance of these findings extends to institutional investor regulation, global emerging market portfolio management, and development of next-generation geopolitical risk models.

Several limitations of this study should be acknowledged. Annual data precludes formal statistical inference; all results are descriptive. The total-return nature of the Ibovespa versus the price-return basis of the TA-125 creates a methodological non-equivalence addressed via sensitivity analysis in Section 5.5, but not fully resolved. Currency adjustments in Section 5.4 should be treated as approximations based on end-of-period exchange rates. The bivariate framework incorporates no controls for common factors such as the VIX or the global interest rate cycle.

Future research should address these limitations in the following ways: first, and most importantly, using monthly index closing levels from the same official sources employed here — publicly available from both TASE (2024b) and B3 (2024) — to estimate a DCC-GARCH model (Engle, 2002) on approximately 72 paired monthly observations over 2020–2025, enabling formal inference on time-varying inter-market correlation and the shock-dependent co-movement predicted by the typology framework; second, constructing matched total-

return series for both indices; third, testing the moderating effect of institutional ownership constraints on post-shock recovery speed using a broader sample of markets; and fourth, expanding the shock typology framework to assess its generalizability beyond the TASE–B3 bilateral case.

Data Availability Statement

Annual index data for the TA-125 are publicly accessible at

https://market.tase.co.il/en/market_data/index/137/historical_data. Annual Ibovespa data (through 2023) are publicly accessible at

https://www.b3.com.br/en_us/market-data-and-indices/indices/broad-indices/indice-ibovespa-ibovespa-historic-statistics.htm. The 2025 Ibovespa closing level is sourced from the B3 (2025) official year-end statistical release. Exchange rate data are publicly accessible from the Bank of Israel (<https://www.boi.org.il>) and the Banco Central do Brasil (<https://www.bcb.gov.br>). All descriptive statistics are reproducible from Table 1 using standard spreadsheet functions in Microsoft Excel (Microsoft 365, version 2024). Monthly index closing level data enabling the DCC-GARCH extension identified in Section 4.2 and Section 7 are available through the same official portals and have not been collected for the present study.

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