

BIST 30 Structural Research & Asset Correlation Report

Statistical Modeling of Sector Risk, Liquidity, and Diversification

Row Labels	Column Labels		Airlines & Transportation		Banking		Consumer & Retail		Industrials		Technology	
	Avg Daily Return (%)	Performance Rank	Avg Daily Return (%)	Performance Rank	Avg Daily Return (%)	Performance Rank	Avg Daily Return (%)	Performance Rank	Avg Daily Return (%)	Performance Rank	Avg Daily Return (%)	Performance Rank
2010			-0.04%		13							
2011			-0.11%		16							
2012			0.21%		5							
2013			-0.08%		15				0.06%	11		
2014			0.13%		8				0.18%	6		
2015	0.04%	10	-0.02%	12	0.00%	7			0.01%	12		
2016	-0.05%	11	0.03%	10	-0.01%	9			0.14%	8		
2017	0.23%	2	0.14%	7	0.14%	4			0.26%	2		
2018	0.14%	7	-0.07%	14	-0.07%	11			-0.09%	13	0.04%	8
2019	0.20%	4	0.23%	3	0.16%	3			0.13%	9	0.37%	2
2020	0.09%	8	0.10%	9	0.14%	5			0.20%	4	0.56%	1
2021	0.20%	5	-0.02%	11	0.00%	8			0.24%	3	0.07%	7
2022												
Qtr1	0.45%	1	0.16%	1	0.19%	1			0.47%	1	0.11%	1
Qtr2	0.55%	1	0.09%	1	0.08%	1			-0.08%	1	-0.24%	1
Qtr3	0.39%	1	0.79%	1	0.77%	1			0.26%	1	0.25%	1
Qtr4	0.84%	1	0.83%	1	0.72%	1			0.88%	1	0.95%	1
2023	0.18%	6	0.32%	2	0.30%	2			0.18%	7	0.24%	4
2024	0.21%	3	0.21%	4	0.12%	6			0.10%	10	0.18%	5
2025	0.04%	9	0.16%	6	-0.03%	10			0.19%	5	0.09%	6

Row Labels	Daily Volatility	Period Low	Period High
Airlines & Transportation			
CLEBI	3.16%	TRY 12.71	TRY 3,285.00
DOCO	2.58%	TRY 160.10	TRY 11,400.00
KORDS	2.49%	TRY 3.18	TRY 116.70
PGSUS	2.93%	TRY 2.26	TRY 287.25
TAVHL	2.57%	TRY 8.05	TRY 294.75
THYAO	2.54%	TRY 4.54	TRY 342.72
Banking			
GARAN	2.49%	TRY 4.14	TRY 154.50
HALKB	2.59%	TRY 4.11	TRY 29.74
ISCTR	2.42%	TRY 0.39	TRY 17.77
QNBFB	3.78%	TRY 1.95	TRY 1,030.00
VAKBN	2.57%	TRY 2.08	TRY 30.10
YKBNK	2.49%	TRY 1.26	TRY 39.46
Consumer & Retail			
BIMAS	2.06%	TRY 18.38	TRY 625.78
BIZIM	2.63%	TRY 4.53	TRY 56.65
MAVI	2.56%	TRY 1.18	TRY 68.50
MGROS	2.40%	TRY 11.03	TRY 600.00
SOKM	2.60%	TRY 6.27	TRY 70.90
ULKER	2.54%	TRY 13.47	TRY 188.70
Industrials			
ARCLK	2.23%	TRY 8.08	TRY 196.10
ASELS	2.45%	TRY 0.81	TRY 222.30
EREGL	2.28%	TRY 0.47	TRY 32.70
KRDMD	2.83%	TRY 0.63	TRY 34.06
TOASO	2.45%	TRY 4.39	TRY 330.02
TUPRS	2.21%	TRY 2.57	TRY 200.20
Technology			
ARDYZ	3.76%	TRY 1.07	TRY 65.51
ARENA	3.34%	TRY 0.81	TRY 61.75
DESPC	3.44%	TRY 2.18	TRY 75.00
KAREL	3.40%	TRY 0.53	TRY 18.43
LOGO	2.75%	TRY 5.66	TRY 194.90
PAPIL	4.06%	TRY 1.01	TRY 45.08

B. Volatility Clustering & Risk Assessment

Objective: To measure downside risk using Standard Deviation (StdDev) of daily returns.

Methodology: Standard Deviation applied to daily price changes, visualized with a red-white-green risk heatmap.

Key Insights:

- [1] During the 2020 pandemic market shock, the Airlines and Technology sectors showed the highest daily volatility (~3.5%+). This reflects operational and future uncertainty respectively. In contrast, Consumer & Retail maintained the lowest volatility profile, thereby proving it is a defensive (safe haven) sector during economic downturns.
- [2] Even though a 2-3% daily volatility range is considered high risk in developed low-inflation markets, these numbers represent the structural baseline for the Turkish market. This elevated standard deviation is a direct outcome of the high-inflation environment, where asset prices must aggressively re-price to preserve real value against currency depreciation.

Row Labels	Avg Daily Volume
Airlines & Transportation	148K
CLEBI	148K
DOCO	37K
KORDS	1.8M
PGSUS	13.5M
TAVHL	4.4M
THYAO	70.0M
Banking	
GARAN	87.7M
HALKB	42.1M
ISCTR	286.0M
QNBFB	227K
VAKBN	49.0M
YKBNK	119.1M
Consumer & Retail	
BIMAS	3.7M
BIZIM	1.2M
MAVI	8.9M
MGROS	1.9M
SOKM	6.6M
ULKER	3.8M
Industrials	
ARCLK	3.6M
ASELS	56.5M
EREGL	90.3M
KRDMD	97.8M
TOASO	3.0M
TUPRS	19.9M
Technology	
ARDYZ	9.1M
ARENA	1.5M
DESPC	867K
KAREL	8.4M
LOGO	973K
PAPIL	12.5M

C. Liquidity & Market Participation

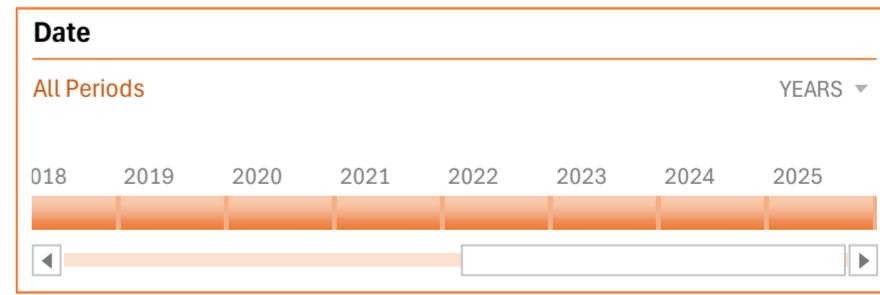
Objective: To analyze capital flow and ease of entry/exit using Average Daily Volume.

Methodology: Average Daily Volume aggregated annually to highlight shifts in investor participation and sector popularity.

Key Insights:

- [1] The Banking sector consistently has the highest liquidity. This massive difference indicates that banking is the primary investment vehicle for large foreign investors, who require deep liquidity to enter/exit positions without moving the price.
- [2] Moreover, the historic volume peak in Banking in 2022 (217M daily average) was driven by a capital flight from fixed-income assets. With interest rates (~15%) much lower than inflation (>80%), domestic capital flooded into the Banking sector as a liquid store of value. Stocks and equities were treated as an inflation hedge rather than a traditional growth investment.
- [3]: The sharp drop in Airlines trading volume (from 22.4M in 2022 to 10M in 2023) signals the end of the aggressive "post-Covid" recovery trade. This 55% decline suggests that after the 2022 peak, investors rotated/shifted their investments elsewhere after taking their profits as the recovery phase ended.

Industry
Airlines & Transportation
Banking
Consumer & Retail
Industrials
Technology



A. Sector Performance & Annual Momentum

Objective: To quantify annual price appreciation across sectors and identify cyclical leadership.

Methodology: Calculated using the average daily return (%) aggregated annually.

Key Insights:

- [1] 2022 had the highest performance across all sectors, this was driven by domestic hyperinflation which had reached up to 80% during the year, which pushed investment capital into equities as a store of value. During the crisis, tangible assets (eg. Consumer & Retail, Industrials) outperformed growth assets (eg. Technology) since investors prioritized physical value over future growth promises, which are common in the Technology industry.
- [2] During 2020 Q1, there was a relatively harsh drop across all sectors due to investor uncertainty and panic associated with the Covid pandemic.
- [3] The Banking sector's growth stayed flat during the stable years of 2010–2013 and boomed from 2019–2023, while peaking in 2022. This shows that Turkish banks are "Regime Sensitive". They generate their massive returns specifically during periods of high inflation and aggressive credit expansion, not in calm low-inflation environments.

	ARCLK	ARDYZ	ARENA	ASELS	BIMAS	BIZIM	CLEBI	DESPC	DOC0	EREGL	GARAN	HALKB	ISCTR	KAREL	KORDS	KRDMD	LOGO	MAVI	MGROS	PAPIL	PGSUS	QNBFB	SOKM	TAVHL	THYAO	TOASO	TUPRS	ULKER	VAKBN	YKBNK
ARCLK	1.000																													
ARDYZ	0.249	1.000																												
ARENA	0.280	0.338	1.000																											
ASELS	0.387	0.290	0.297	1.000																										
BIMAS	0.341	0.190	0.181	0.278	1.000																									
BIZIM	0.329	0.264	0.279	0.328	0.319	1.000																								
CLEBI	0.307	0.246	0.216	0.288	0.227	0.280	1.000																							
DESPC	0.268	0.329	0.348	0.285	0.177	0.302	0.236	1.000																						
DOC0	0.177	0.113	0.111	0.141	0.135	0.116	0.238	0.140	1.000																					
EREGL	0.408	0.213	0.251	0.386	0.322	0.295	0.250	0.241	0.183	1.000																				
GARAN	0.414	0.233	0.213	0.398	0.337	0.317	0.295	0.233	0.120	0.364	1.000																			
HALKB	0.425	0.263	0.237	0.415	0.304	0.330	0.259	0.260	0.115	0.402	0.682	1.000																		
ISCTR	0.440	0.258	0.239	0.414	0.347	0.333	0.297	0.258	0.120	0.412	0.807	0.707	1.000																	
KAREL	0.328	0.300	0.306	0.347	0.212	0.326	0.264	0.295	0.169	0.310	0.286	0.276	0.262	1.000																
KORDS	0.420	0.306	0.306	0.375	0.283	0.374	0.317	0.328	0.217	0.409	0.304	0.338	0.350	0.358	1.000															
KRDMD	0.435	0.272	0.292	0.445	0.318	0.358	0.296	0.284	0.172	0.634	0.451	0.484	0.476	0.349	0.435	1.000														
LOGO	0.318	0.325	0.319	0.355	0.260	0.308	0.252	0.317	0.185	0.308	0.279	0.283	0.297	0.332	0.351	0.341	1.000													
MAVI	0.353	0.308	0.266	0.349	0.312	0.322	0.335	0.258	0.165	0.310	0.387	0.342	0.410	0.312	0.380	0.383	0.361	1.000												
MGROS	0.363	0.237	0.299	0.384	0.472	0.459	0.299	0.261	0.108	0.338	0.419	0.407	0.424	0.320	0.346	0.410	0.316	0.377	1.000											
PAP0IL	0.185	0.319	0.276	0.312	0.129	0.232	0.221	0.270	0.094	0.190	0.169	0.171	0.177	0.223	0.242	0.236	0.271	0.217	0.197	1.000										
PGSUS	0.384	0.258	0.229	0.406	0.265	0.304	0.473	0.238	0.264	0.350	0.400	0.387	0.414	0.314	0.380	0.432	0.268	0.406	0.357	0.194	1.000									
QNBFB	0.177	0.178	0.139	0.193	0.153	0.168	0.140	0.130	0.068	0.149	0.255	0.247	0.247	0.154	0.175	0.206	0.156	0.187	0.203	0.094	0.184	1.000								
SOKM	0.335	0.255	0.252	0.312	0.474	0.509	0.255	0.250	0.115	0.297	0.297	0.300	0.307	0.313	0.349	0.375	0.270	0.365	0.542	0.163	0.288	0.156	1.000							
TAVHL	0.393	0.261	0.255	0.359	0.316	0.283	0.422	0.241	0.295	0.379	0.354	0.331	0.375	0.320	0.377	0.392	0.314	0.388	0.340	0.210	0.570	0.155	0.316	1.000						
THYAO	0.455	0.294	0.307	0.483	0.318	0.365	0.461	0.295	0.249	0.455	0.471	0.468	0.482	0.356	0.434	0.510	0.308	0.393	0.413	0.207	0.722	0.194	0.353	0.590	1.000					
TOASO	0.465	0.271	0.284	0.364	0.342	0.300	0.292	0.252	0.194	0.399	0.363	0.380	0.379	0.298	0.395	0.407	0.367	0.370	0.353	0.186	0.335	0.175	0.346	0.362	0.401	1.000				
TUPRS	0.395	0.210	0.241	0.382	0.317	0.255	0.264	0.195	0.206	0.409	0.373	0.367	0.400	0.273	0.385	0.433	0.285	0.330	0.311	0.172	0.376	0.163	0.334	0.394	0.459	0.389	1.000			
ULKER	0.341	0.271	0.282	0.330	0.341	0.439	0.267	0.260	0.123	0.300	0.340	0.333	0.365	0.261	0.341	0.353	0.301	0.359	0.434	0.206	0.316	0.213	0.427	0.323	0.353	0.365	0.312	1.000		
VAKBN	0.428	0.257	0.230	0.426	0.311	0.335	0.264	0.265	0.117	0.399	0.753	0.818	0.769	0.296	0.318	0.477	0.298	0.364	0.439	0.195	0.393	0.268	0.311	0.342	0.468	0.380	0.380	0.343	1.000	
YKBNK	0.435	0.265	0.235	0.387	0.356	0.328	0.306	0.259	0.116	0.384	0.805	0.685	0.829	0.266	0.326	0.461	0.296	0.395	0.420	0.195	0.400	0.238	0.310	0.375	0.473	0.403	0.388	0.358	0.752	1.000

D. Cross-Asset Correlation Matrix

Objective: To identify portfolio diversification opportunities by calculating the Pearson Correlation Coefficient (r) between stock price movements.

Methodology: A 30×30 matrix where 1.0 indicates perfect synchronization and 0 indicates independence.

Key Insight:

[1] Intra-sector correlation is dangerously high, especially in Banking (eg. GARAN and YKBNK show a correlation of ~0.80). This proves that holding multiple banks provides almost zero diversification benefit. If one fails, they all likely fail due to shared regulatory and interest rate risks.

[2] The most effective diversification strategy is pairing Banking stocks with Technology or Retail. GARAN (Bank) has a low correlation of just ~0.23 with ARDYZ (Tech) and ~0.34 with BIMAS (Retail). Adding these sectors to a bank-heavy portfolio significantly reduces overall variance, as their price drivers (consumer

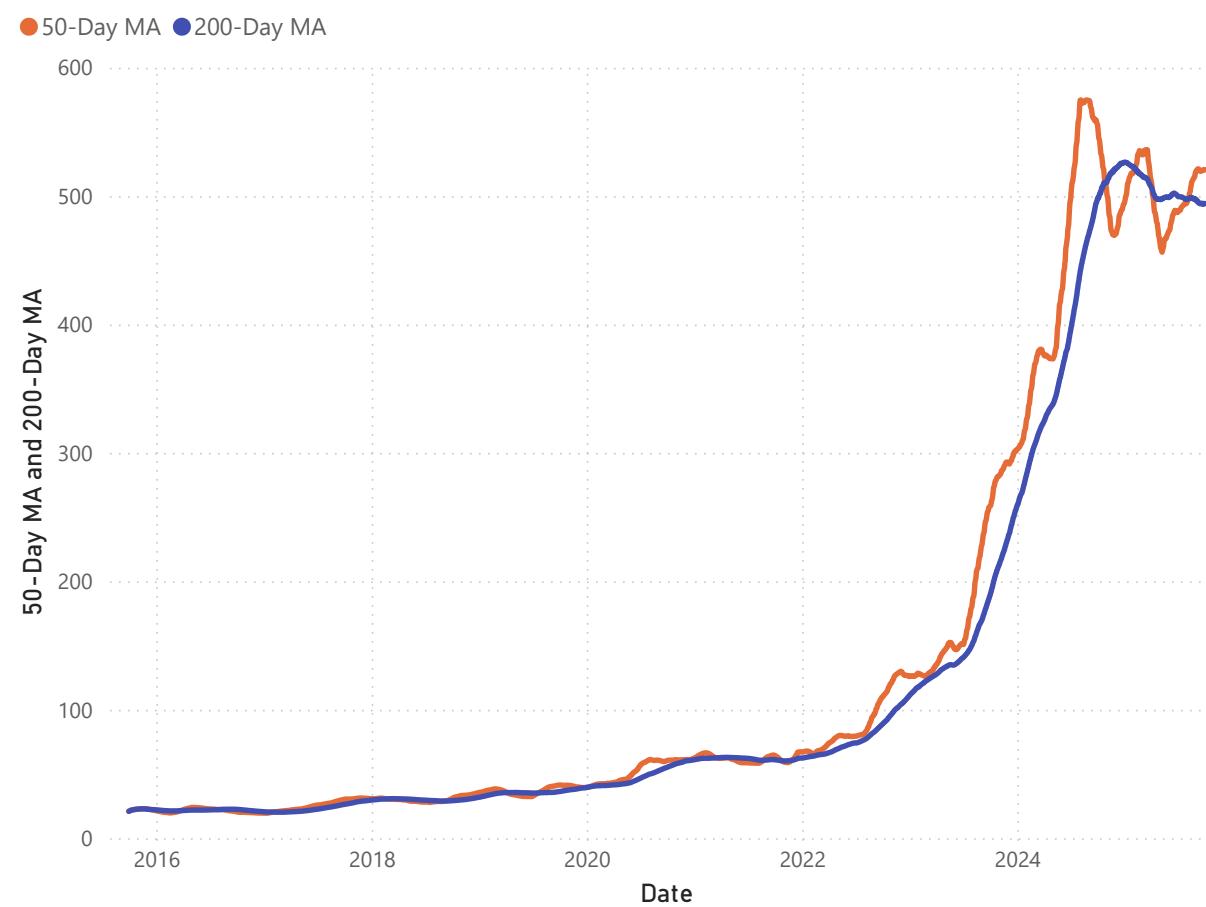
BIST 30 Equity Performance & Risk Analytics

Historical back-testing of Trend Momentum, Volatility Clusters, and Capital Drawdowns.

Ticker

ARCLK	ARENA	BIMAS	CLEBI	DOCO	GARAN	ISCTR	KORDS	LOGO	MGROS	PGSUS	SOKM	THYAO	TUPRS	VAKBN
ARDYZ	ASELS	BIZIM	DESPC	EREGL	HALKB	KAREL	KRDMD	MAVI	PAPIL	QNBFB	TAVHL	TOASO	ULKER	YKBNK

Test E: Golden Cross

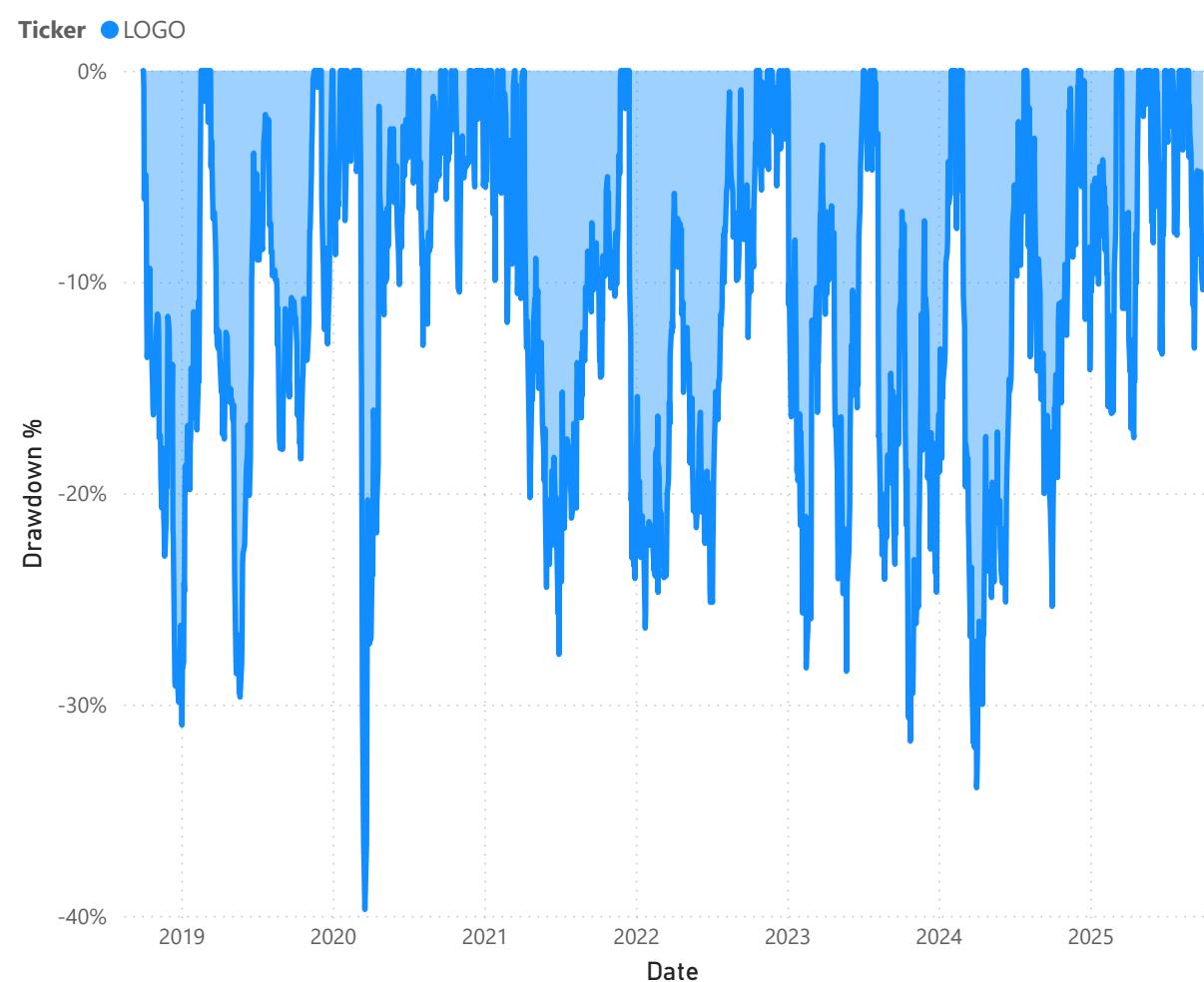


Objective: To identify major trend reversals by comparing short-term momentum against long-term support levels.

Methodology: A dual-line analysis where the 50-Day Moving Average (short-term) crossing above the 200-Day Moving Average (long-term) triggers a "Golden Cross" buy signal.

Key Insight: In the "Golden Cross", if the 50-Day MA line crosses above the 200-Day MA line, it signals a bull market. Conversely, when the 50-Day MA line goes under the 200-Day MA, it shows signs of a bearish market. In strong bull markets, the price often dips to touch the 200-Day line and bounces back up, confirming the trend's health. A sustained drop below this line typically signals the start of a long-term bear market.

Test F: Maximum Drawdown

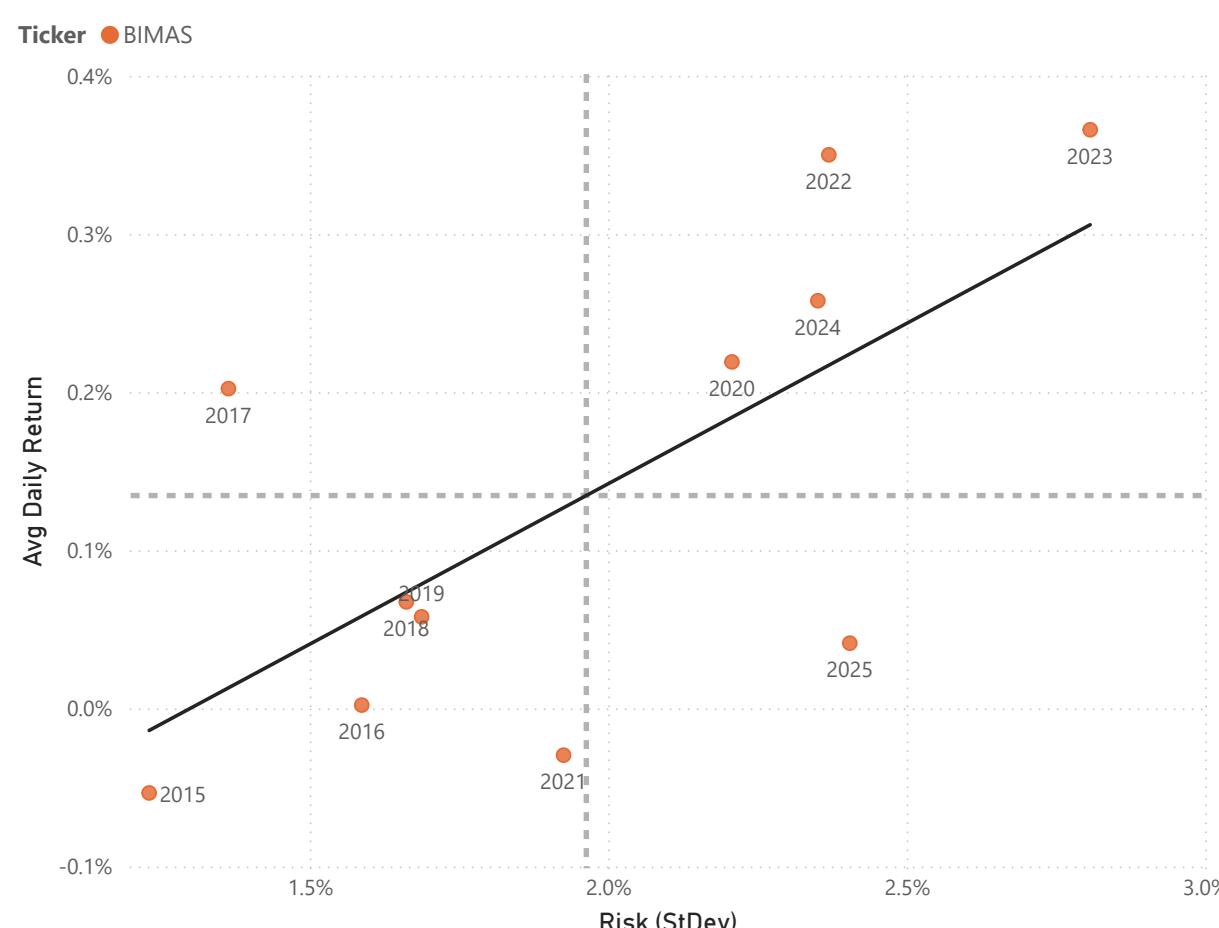


Objective: To measure the largest peak-to-trough decline to assess 'recovery time' and capital preservation risk during market crashes.

Methodology: Calculated dynamically as [(Current Price - Historical Peak) / Historical Peak]. Used for visualizing the depth of losses from the all-time high.

Key Insight: The LOGO chart shows a major ~40% drop in early 2020, which stands out as the biggest decline in its data. This was driven by a massive wave of uncertainty as the pandemic began. Investors initially panicked and feared that a stay-at-home economy would cause businesses to cut their software budgets. However, the most important part of the visual is how fast the price recovered. The market quickly realized that as people moved home, they actually needed more digital tools and software to stay competitive. This turned a scary ~40% loss into a sharp recovery, as the company's services became even more necessary for businesses to survive the shift to remote work.

Test G: Risk-Adjusted Returns



Objective: To map the trade-off between volatility (risk) and capital gains (return) to identify efficient assets.

Methodology: A scatter plot divided into four performance quadrants by market averages:

- Top-Left: High Return / Low Risk. (Optimal)
- Top-Right: High Return / High Risk. (Acceptable)
- Bottom-Left: Low Return / Low Risk. (Acceptable)
- Bottom-Right: Low Return / High Risk. (Critical)

An optional trend line may show how dispersed or linearly correlated the points are.

Key Insight: Unlike the Banking sector, where performance points are widely scattered (indicating disjointed risk/return behavior), the Retail Sector demonstrates a relatively stronger linear correlation, with BIMAS exceptionally leading the linear correlation. The data points tightly hug the trend line, indicating a highly predictable risk premium for BIMAS. This means that historically, every unit of incremental risk taken was consistently rewarded with proportional returns.