MORNINGSTAR Indexes

Dispersion as a Gauge of Market Regime

Portfolio return dispersion can be used to understand the state of the equity market, as well as risks and opportunities.

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Executive Summary

This paper explores the concept of portfolio return dispersion, with the ultimate goal of applying it to investment decision-making. Dispersion, which measures the diversity in constituent returns, can be used as a metric, complementary to indicators like volatility and correlation, to provide a holistic measure of portfolio risk. It can also serve as a barometer of the equity market. The historical dispersion of three-month return in the Morningstar US Market Index reveals two distinct states: a baseline state when dispersion arises due to the intrinsic diversity of businesses fueling economic growth and a shock state when dispersion reflects fractures in the market's structure in response to economic crises. Not all crisis periods are the same though, evidenced by changing sectoral drivers of portfolio return dispersion. Lastly, dispersion is shown to serve as an effective gauge of shifts in market regime. Considering the density of information that return dispersion encapsulates, this paper highlights the value in monitoring and understanding it.

Key Takeaways

- Portfolio return dispersion, or cross-sectional portfolio volatility, is a measure of the degree of diversity in constituent returns of a portfolio over a specific window. As a barometer of the market's internal consensus, dispersion's true power lies in how it evolves over time, the forces that drive this movement, and what those trends mean for investors.
- Positive baseline dispersion in the 15%-25% range is observed in the Morningstar US Market Index from September 2002 to December 2025. This level corresponds to periods when the market is in its natural state. The biggest contributors to dispersion in these periods tend to be mid- and small-cap companies. During calmer periods, the contribution of different sectors to total dispersions is balanced.
- Dispersion behavior during crisis periods shows that not all market stresses are the same. The sectoral contribution to stock-level dispersion in crisis periods is lopsided, with the top contributing sectors depending on the nature of the crisis.
- Dispersion also serves as an effective gauge of shifts in market regimes.
- Risk managers can use dispersion to evaluate regime changes, gauge the effectiveness of intraequity diversification, and model risk.
- In today's market environment of rapid sector rotation, heightened geopolitical uncertainty, and persistent inflationary pressure, dispersion can be an effective tool in understanding the state, nature, and future evolution of the equity market better.

Portfolio Return Dispersion: The What and Why

Portfolio return dispersion, or cross-sectional portfolio volatility, is a measure of the degree of diversity in constituent returns of a portfolio at a given point in time. It is measured as the weighted standard deviation of constituent returns about the portfolio's return:

$$Dispersion = \sqrt{\Sigma w_i (r_i - P)^2}$$

where

w_i: Constituent's weight in the portfolio

r_i: Constituent's return over a predetermined horizon

P: Portfolio's return over the same horizon

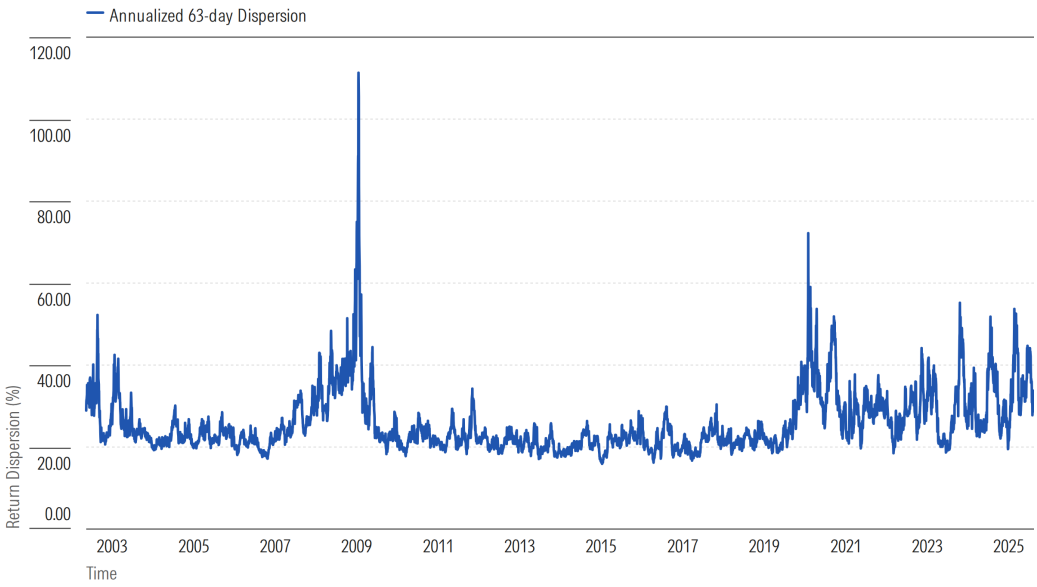
As a measure of return spread, dispersion can offer complementary information to that provided by other risk measures such as correlation and volatility in a holistic analysis of portfolio risk. Sample correlation is a temporal measure, is calculable for a pair of assets at a time, measures only linear association, and is prone to estimation error. Similarly, portfolio volatility captures the extent to which a portfolio's period-specific returns hover around the average return over that period. Dispersion, as a cross-sectional metric, offers insight into the spread of constituent-level returns, which make up the portfolio return.

As a barometer of the market's internal consensus, dispersion's true power lies in how it evolves over time, the forces that drive this movement, and what those trends mean for investors. Is there a baseline level of dispersion? What does it signify? How does dispersion behave in tumultuous periods? Which parts of the market's machinery drive it? A look into trends in the Morningstar US Market Index's dispersion offers an interesting historical perspective.

Overview of the US Market Dispersion

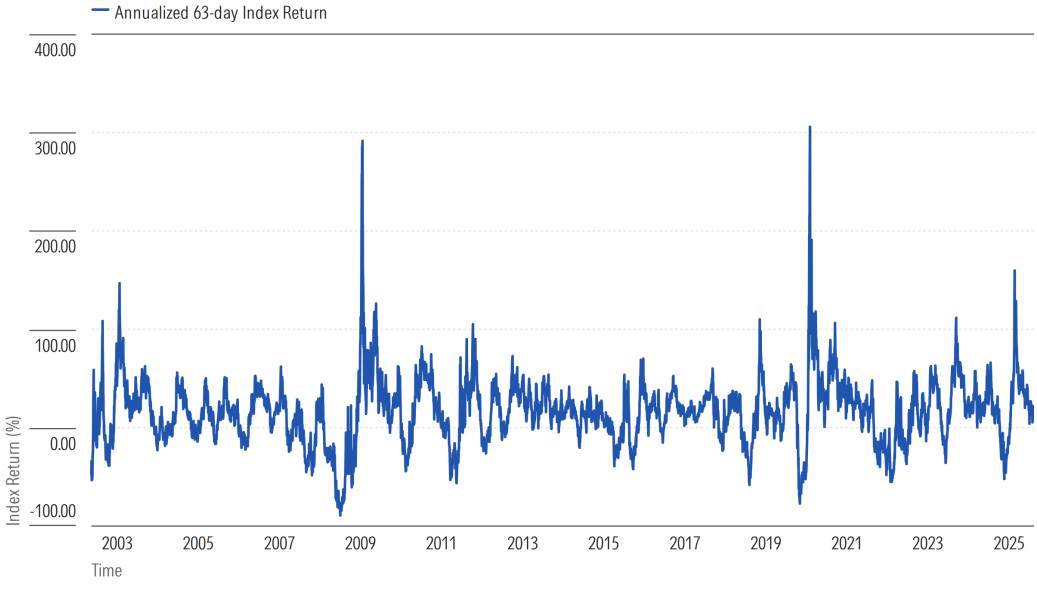
On each day from September 2002 to December 2025, dispersion in 63-day returns of the Morningstar US Market Index's constituents is shown in Exhibit 1. Three observations can be based on it. First, dispersion in the US Market appears to be floored around the 15%-25% range. Second, dispersion behavior can be distinguished into four phases, each reflecting a different state of the US economy: Phase 1 spanning Sept. 30, 2002–March 13, 2007, Phase 2 spanning March 14, 2007–Oct. 27, 2009, Phase 3 spanning Oct. 28, 2009–March 16, 2020, and Phase 4 spanning March 17, 2020–Dec. 31, 2025. Third, spikes in dispersion appear to be associated with greater movement/volatility in the index's return (Exhibit 2).

Exhibit 1 Daily Annualized 63-Day Return Dispersion in the US Market Index From September 2002 to December 2025



Source: Morningstar. Data as of Dec. 31, 2025.

Exhibit 2 Daily Annualized 63-Day Total Return of the US Market Index From September 2002 to December 2025



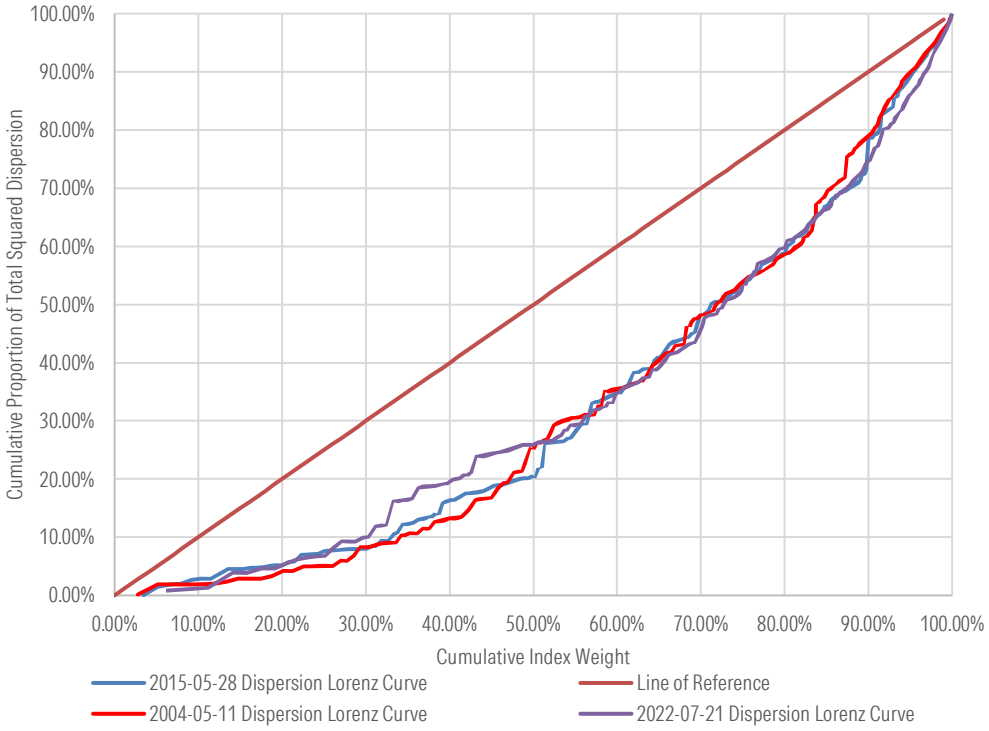
Source: Morningstar. Data as of Dec. 31, 2025.

Baseline Dispersion: The Hum of Business

A positive baseline dispersion in the 15%-25% range is intuitive, since even in periods of market calm, each company's returns are subject to its own unique sources of risk, and sector returns have distinct fundamental drivers. In this sense, the persistent 15%-25% floor in the US market dispersion can be thought of as a crude proxy of realized idiosyncratic risk.

A look into the contribution of top index holdings, outliers, and sectors offers more color on the sources of baseline dispersion. Drivers of dispersion are identified by looking at the squared deviations of constituent returns from the portfolio return. Three dates when dispersion was in baseline range are selected from different phases: May 11, 2004, from Phase 1 (19.95%), May 28, 2015, from Phase 3 (minimum of 15.91% over the historical period considered), and July 21, 2022, from Phase 4 (18.50%).

Exhibit 3 Contributions to Baseline Dispersion From Across the Capitalization Spectrum—Lorenz Curves



Source: Morningstar.

Exhibit 4 Squared Return Deviation of Top 20 Holdings by Index Weight in the US Market Index on May 28, 2015

ISIN	Security Name	Index Weight	63-day Return	Squared Return Deviation
US0378331005	APPLE INC.	3.39%	1.47%	0.00%
US5949181045	Microsoft Corp	1.72%	8.41%	0.53%
US30231G1022	Exxon Mobil Corp	1.58%	-3.19%	0.18%
US4781601046	JOHNSON & JOHNSON	1.24%	-0.88%	0.04%
US3696041033	General Electric Co	1.23%	6.72%	0.32%
US0846707026	Berkshire Hathaway B	1.17%	-2.43%	0.12%
US9497461015	WELLS FARGO & CO	1.16%	2.62%	0.02%
US46625H1005	JP Morgan Chase & Co	1.09%	8.22%	0.51%
US7427181091	PROCTER & GAMBLE CO	0.95%	-6.09%	0.52%
US7170811035	PFIZER INC	0.93%	0.40%	0.00%
US92343V1044	VERIZON COMMUNICATIONS INC	0.91%	1.47%	0.00%
US1667641005	Chevron Corp	0.86%	-2.61%	0.14%
US00206R1023	AT&T Inc	0.80%	2.32%	0.02%
US0605051046	Bank of America Corp	0.78%	4.26%	0.10%
US2546871060	WALT DISNEY CO/THE	0.76%	5.71%	0.21%
US58933Y1055	Merck & Co Inc Common Stock	0.75%	2.07%	0.01%
US30303M1027	Facebook Inc	0.74%	-0.33%	0.02%
US3755581036	GILEAD SCIENCES INC	0.74%	8.31%	0.52%
US1729674242	Citigroup Inc	0.73%	4.18%	0.10%
US0231351067	Amazon.com Inc	0.72%	10.85%	0.95%
		22.26%	**Top 20 Simple Average**	**0.22%**
			Index Simple Average	**1.30%**

Source: Morningstar. Data as of May 28, 2015.

Exhibit 3 shows Lorenz curves for the three selected dates when dispersion is in the baseline range. Lorenz curves visually depict how a variable (dispersion) is distributed across different classes of a group (capitalization segments). The horizontal axis of Exhibit 3 is the cumulative index weight of constituents of the US Market Index when sorted in descending order of weight. The vertical axis is the cumulative proportion of total squared dispersion. The upward-sloping line of reference represents an index whose constituents' contribution to weight and dispersion is identical.

The bow-shaped Lorenz curve for the US Market Index's constituents on May 28, 2015 (Exhibit 3), the day when dispersion was at its minimum, reveals unequal contributions of weight classes to market dispersion. When sorted from the largest to the smallest, constituents encompassing the first tercile of the index's float market capitalization contribute 10.52% to squared dispersion, whereas those in the second and third terciles contribute 33.07% and 56.41% to squared dispersion, respectively.

Exhibit 5 Top 20 Holdings by Squared Return Deviation in the US Market Index on May 28, 2015

ISIN	Security Name	Size Segment	Index Weight	Cumulative Index Weight	63-day Return	Squared Return Deviation
US87159A1034	Synageva BioPharma Corp Common Stock	SML	0.0224%	78.33%	115.84%	131.67%
US26746E1038	Dyax Corp	SML	0.0169%	85.39%	70.93%	48.77%
US9486261061	Weight Watchers Intl Inc	SML	0.0007%	100.00%	-67.60%	47.19%
IE00BQPVQZ61	Horizon Pharma plc	SML	0.0193%	82.43%	69.01%	46.12%
US55003T1079	Lumber Liquidators Holdings Inc	SML	0.0026%	99.68%	-56.00%	32.60%
US53220K5048	Ligand Pharmaceutical Inc B	SML	0.0069%	96.31%	57.92%	32.29%
US7045491047	Peabody Energy Corp	SML	0.0042%	98.82%	-53.81%	30.14%
US8305661055	Skechers USA Inc A	SML	0.0194%	80.85%	55.41%	29.50%
US1280302027	Cal Maine Foods Inc	SML	0.0075%	95.35%	51.39%	25.30%
US40537Q2093	Halcon Resources Corporation	SML	0.0019%	99.87%	-46.70%	22.84%
KYG4412G1010	Herbalife	MID	0.0156%	86.55%	48.54%	22.51%
US91347P1057	Universal Display Corp	SML	0.0096%	93.15%	46.68%	20.78%
US2082421072	Conns Inc	SML	0.0040%	99.00%	45.51%	19.73%
US1564311082	Century Aluminum Co	SML	0.0026%	99.55%	-41.50%	18.14%
US0376041051	Apollo Education Group Inc	SML	0.0071%	95.82%	-40.49%	17.29%
US7234561097	Pinnacle Entertainment Inc	SML	0.0098%	92.76%	41.32%	16.18%
US86732Y1091	SunEdison Inc Common Stock	MID	0.0346%	68.05%	39.36%	14.64%
US76117W1099	Resolute Forest Products	SML	0.0049%	98.19%	-37.11%	14.60%
US3932221043	Green Plains Inc.	SML	0.0049%	98.31%	38.96%	14.34%
US80007P3073	Sandridge Energy Inc	SML	0.0021%	99.80%	-36.51%	14.14%
			0.1968%		**Top 20 Simple Average**	**30.94%**
					Index Simple Average	**1.30%**

Source: Morningstar. Data as of May 28, 2015.

This is also confirmed by the data in Exhibit 4.[1] The top 20 holdings in the index (with a collective weight of 22.26%) have an average squared return deviation of 0.22%, much lower than the 1.30% at the index level. Exhibit 5 shows that constituents that are farthest away from the index's return lie at the tail end of the capitalization spectrum. Under calm market conditions, dispersion, therefore, has tended to be driven less by mega-cap companies and more by the multitude of relatively smaller companies making up the US economy. This is reinforced by the Lorenz curves on the two other selected dates, which lie in the baseline dispersion range.

Lastly, as substantiated in a later section in Exhibit 9(a), a balanced contribution of sectors to dispersion was noted on May 28, 2015, relative to their weights in the index. Constituents in healthcare, technology, consumer cyclical, and consumer defensive sectors constituted 52.93% of the index and contributed 67.19% to the US market dispersion.

When Dispersion Peaks

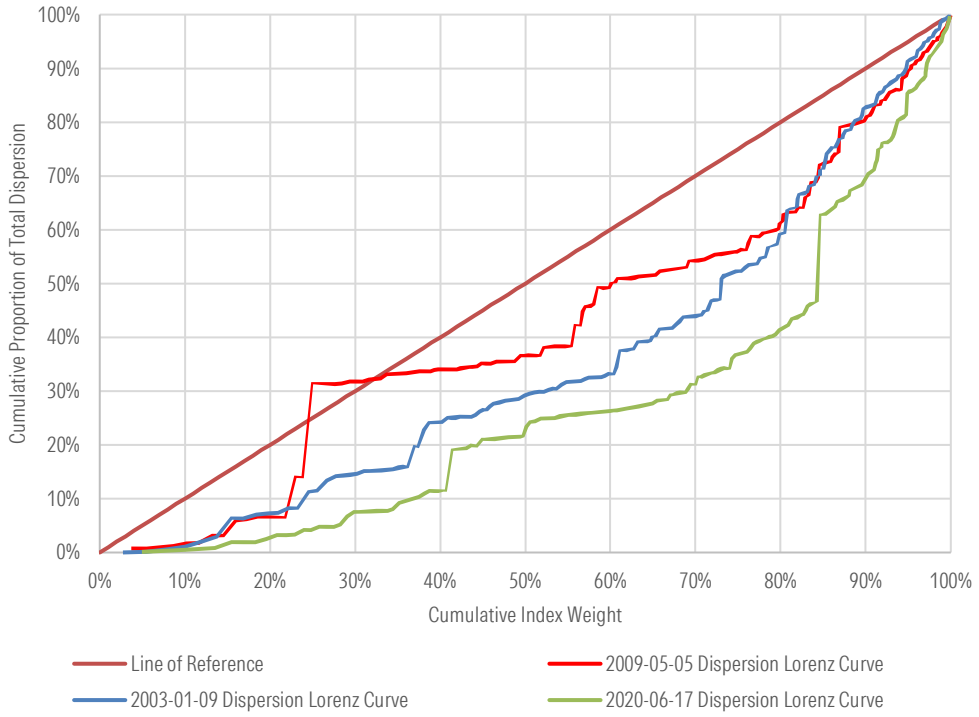
Dynamics within the US market index changed markedly compared with those at baseline dispersion levels, when market dispersion peaked following the dot-com bust, the 2008 global financial crisis, and

1 Squared Return Deviation (the final column) represents the squared spread between the constituent and index return, calculated using decimal values.

with the covid-19 turmoil. Dispersion behavior is examined at three peak dates: June 5, 2009 (maximum of 111.31% over the historical period considered), Jan. 9, 2003 (52.24%), and June 17, 2020 (72.17%).

The Lorenz curves in Exhibit 6 show that, during peak periods, dispersion came from various parts of the capitalization spectrum depending on the nature of the crisis prevailing in those times.

Exhibit 6 Contributors to Peak Dispersion Levels From Across the Capitalization Spectrum—Lorenz Curves



Source: Morningstar.

Since the curve for the global financial crisis peak date is the closest to the line of reference, dispersion was more widespread across weight classes during the global financial crisis. Exhibit 7 shows highly divergent returns (in terms of squared return deviation) posted by companies like Bank of America (569.06%), Wells Fargo (219.48%), and JPMorgan Chase (60.49%) at the top end of the index relative to the index's return. Exhibit 8 shows that the average contribution of the top contributors to squared dispersion was 30 times that of all constituents in the index. The global financial crisis unfolded because of systemic risks within the financial system, which affected not only financial-services giants like Bank of America, JPMorgan Chase, Wells Fargo, but also companies in other sectors like consumer cyclical (Ford Motor Company) and basic materials (Dow). Exhibits 11 and 12 show data on constituents that contributed to the spike in the Lorenz curve for the global financial crisis in the 20%-25% and 55%-60% weight segments, respectively.

The curves in Exhibit 6 for Jan. 9, 2003 (after the dot-com bubble), and June 17, 2020 (the covid-19 onset), peak dates are more bowed toward the horizontal axis, indicating relatively less contribution by the top

end of the capitalization spectrum to total dispersion, when compared with the global financial crisis. Exhibits 9 (b)-(d) show that, for all three peak dates, only a handful of sectors contribute disproportionately to total dispersion. These were technology and communication services for the dot-com peak date, financial services and consumer cyclical for the global financial crisis peak date, and consumer cyclical and technology for the covid-19 peak date.

Exhibit 7 Squared Return Deviation of Top 20 Holdings by Index Weight in the US Market Index on June 5, 2009

ISIN	Security Name	Index Weight	63-day Return	Squared Return Deviation
US30231G1022	EXXONMOBIL CORPORATION	3.71%	14.65%	6.17%
US5949181045	Microsoft Corp	1.80%	45.82%	0.40%
US7427181091	PROCTER & GAMBLE COMPANY	1.60%	17.37%	4.89%
US4781601046	JOHNSON & JOHNSON	1.59%	17.63%	4.78%
US00206R1023	AT&T INC.	1.50%	10.52%	8.40%
US4592001014	International Business Machines Corp	1.49%	25.63%	1.92%
US3696041033	GENERAL ELECTRIC COMPANY	1.47%	91.78%	27.34%
US1667641005	CHEVRON CORPORATION	1.43%	20.22%	3.71%
US46625H1005	J.P. MORGAN CHASE & CO.	1.33%	117.27%	60.49%
US0378331005	APPLE INC.	1.32%	69.60%	9.06%
US9311421039	WAL-MART STORES INC.	1.28%	5.59%	11.50%
US17275R1023	CISCO SYSTEMS INC.	1.20%	40.13%	0.00%
US38259P5089	GOOGLE INC.	1.09%	43.99%	0.20%
US1912161007	Coca-Cola Company	1.08%	27.76%	1.38%
US9497461015	WELLS FARGO COMPANY	1.02%	187.64%	219.48%
US7170811035	PFIZER INC.	1.01%	15.29%	5.86%
US0605051046	BANK OF AMERICA CORPORATION	0.93%	278.04%	569.06%
US4282361033	HEWLETT-PACKARD COMPANY	0.92%	38.87%	0.00%
US7181721090	PHILIP MORRIS INTERNATIONAL INC	0.92%	34.15%	0.29%
US4581401001	INTEL CORPORATION	0.91%	29.40%	1.02%
		27.60%	**Top 20 Simple Average**	**46.80%**
			Index Simple Average	**59.67%**

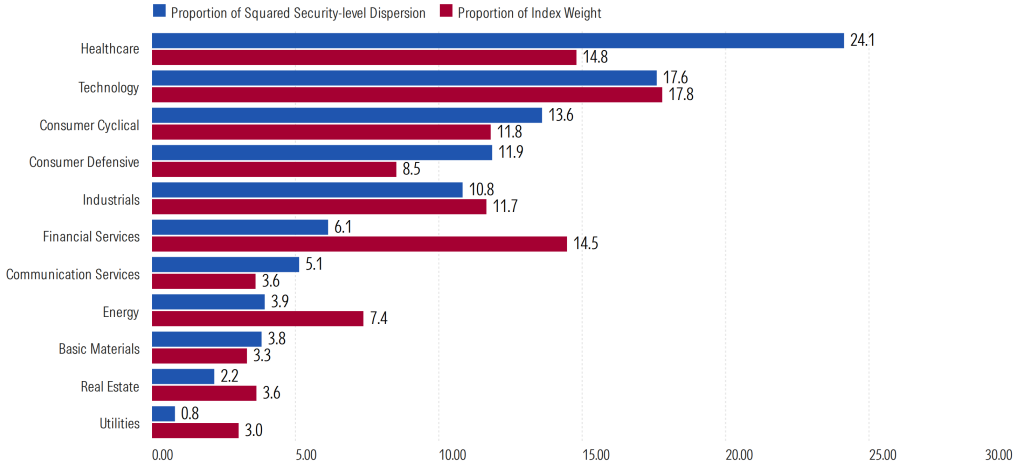
Source: Morningstar. Data as of June 5, 2009.

Exhibit 8 Top 20 Holdings by Squared Return Deviation in the US Market Index on June 5, 2009

ISIN	Security Name	Size Segment	Index Weight	Cumulative Index Weight	63-day Return	Squared Return Deviation
US0433531011	Meritor Inc	SML	0.00%	99.87%	726.67%	4722.07%
US37247D1063	GENWORTH FINANCIAL INC.	MID	0.03%	86.91%	694.05%	4284.41%
US6762201068	OFFICE DEPOT INC.	SML	0.01%	94.25%	644.12%	3655.70%
US71902E1091	The Phoenix Companies Inc.	SML	0.00%	99.95%	586.21%	2988.96%
US87264S1069	TRW AUTOMOTIVE HOLDINGS CORPORATION	SML	0.01%	98.98%	520.63%	2314.88%
US1564311082	CENTURY ALUMINUM COMPANY	SML	0.00%	99.58%	477.27%	1916.51%
US5178341070	LAS VEGAS SANDS INC.	MID	0.04%	84.49%	465.54%	1815.13%
US3167731005	FIFTH THIRD BANCORP	MID	0.04%	83.48%	455.07%	1727.00%
US8798681073	TEMPLE-INLAND INC.	SML	0.01%	94.93%	453.32%	1712.55%
US22765Y1047	EnLink Midstream LLC Units	SML	0.00%	99.96%	436.78%	1578.38%
US0268741073	AMERICAN INTERNATIONAL GROUP	MID	0.04%	82.88%	388.57%	1218.55%
US8616421066	Stone Energy Corp Shs	SML	0.00%	99.82%	383.98%	1186.70%
US0442091049	ASHLAND INC.	SML	0.02%	91.02%	381.93%	1172.63%
US1534351028	Central European Distribution Corporation	SML	0.01%	95.32%	366.00%	1066.05%
US9092141087	UNISYS CORPORATION	SML	0.01%	99.18%	354.55%	992.58%
US8343765017	SOLUTIA INC.	SML	0.00%	99.30%	335.62%	876.89%
US1954933099	Colonial BancGroup Inc Ordinary Shares	SML	0.00%	99.90%	334.48%	870.19%
US5179421087	LaSalle Hotel Properties SBI	SML	0.01%	96.85%	328.91%	837.61%
BMG0585R1060	ASSURED GUARANTY LTD.	SML	0.01%	96.64%	328.26%	833.85%
US98310W1080	WYNDHAM WORLDWIDE CORPORATION	SML	0.02%	90.11%	327.82%	831.34%
			0.28%		**Top 20 Simple Average**	**1830.10%**
					Index Simple Average	**59.67%**

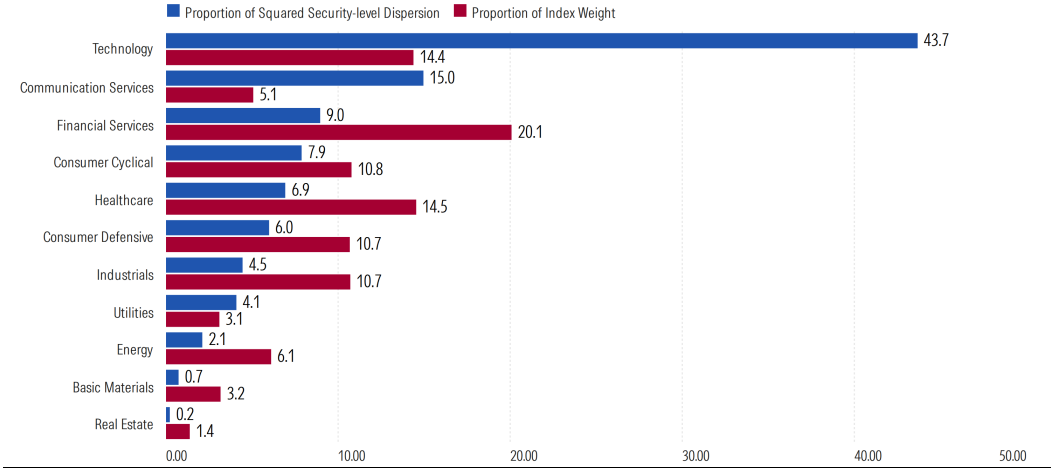
Source: Morningstar. Data as of June 5, 2009.

Exhibit 9 (a) Contribution of Sectors to US Market Dispersion and Index Weight on May 28, 2015



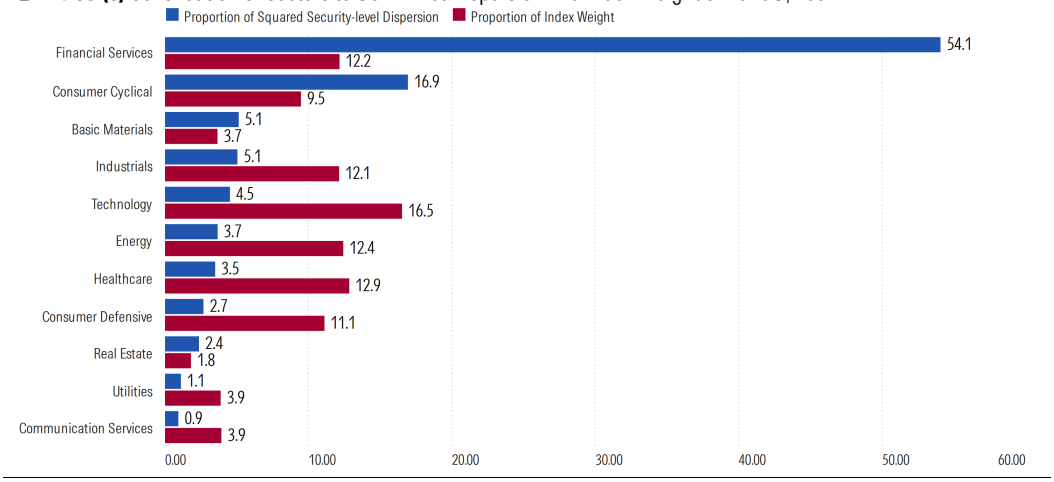
Source: Morningstar. Data as of May 28, 2015.

Exhibit 9 (b) Contribution of Sectors to US Market Dispersion and Index Weight on Jan. 9, 2003



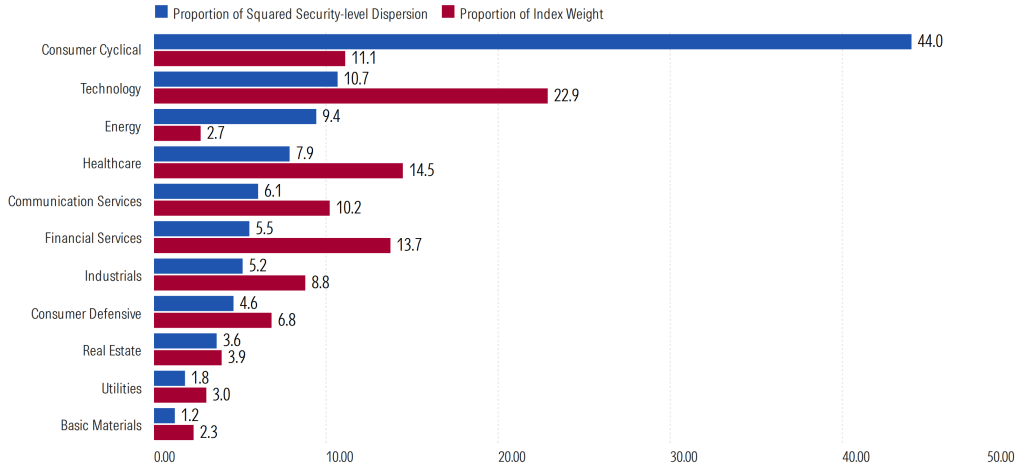
Source: Morningstar. Data as of Jan. 9, 2003.

Exhibit 9 (c) Contribution of Sectors to US Market Dispersion and Index Weight on June 5, 2009



Source: Morningstar. Data as of June 5, 2009.

Exhibit 9 (d) Contribution of Sectors to US Market Dispersion and Index Weight on June 17, 2020



Source: Morningstar. Data as of June 17, 2020.

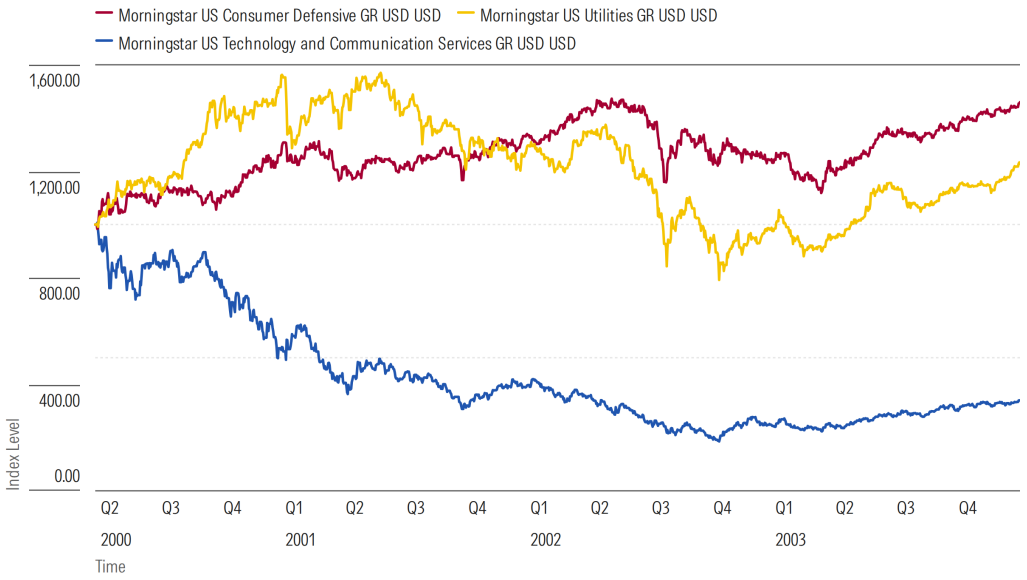
Having looked at the fundamental drivers of baseline and peak dispersion levels, we now try to dissect the macro drivers for dispersion behavior in the four phases indicated by the time series in Exhibit 1.

Four Phases in the Evolution of the US Market Dispersion

From September 2002 to March 2007 (Phase 1), US market dispersion (Exhibit 1) started off by being choppy and volatile, before settling within the 17%-30% range. The initial choppiness is attributable to the aftereffects of several factors, which contributed to sluggish economic growth in 2002: the dot-com crash, cutbacks in capital spending in 2001, evidence of corporate malfeasance (the Enron scandal), and an escalation of geopolitical risks (situation in Iraq).[2]

This backdrop, in addition to the divergence of performance across sectors, contributed to elevated dispersion in the initial period of Phase 1. Morningstar US Technology and Communication Services TR USD lost 66.04% between March 24, 2000, and Dec. 31, 2003, whereas old economy sector indexes like Morningstar US Utilities TR USD and Morningstar US Consumer Defensive TR USD appreciated by 22.88% and 45.98%, respectively (Exhibit 10). Dispersion in the remainder of Phase 1 settled to relatively moderate levels as gross domestic product growth accelerated and became more broad-based, business spending recovered, and investor confidence improved.[3,4] The US stock market, as captured by the Morningstar US Market TR USD Index, also gained 33.15% over Jan. 1, 2004, to March 13, 2007.

Exhibit 10 Morningstar US Technology and Communication Services, Utilities and Energy Sector Indexes (TR USD) (March 24, 2000 to Dec. 31, 2003)



Source: Morningstar. Data as of Dec. 31, 2003.

2 Federal Reserve Board. "Monetary Policy Report to the Congress Pursuant to the Employment Act of 1946, February 25, 2003." Federal Reserve Board, February 2003. Accessed Oct. 15, 2025. https://www.federalreserve.gov/boarddocs/hh/2003/February/ReportSection1.htm.

3 The White House. "Fact Sheet: America's Economy on the Path to Recovery." Jan. 9, 2004. Accessed Oct. 15, 2025. https://georgewbush-whitehouse.archives.gov/news/releases/2004/01/20040109-5.html.

4 Bureau of Economic Analysis. "Gross Domestic Product by State, Advance 2007 and Revised 2004-2006." US Department of Commerce, June 5, 2008. Accessed Oct. 15, 2025. https://www.bea.gov/news/2008/gross-domestic-product-state-advance-2007-and-revised-2004-2006

Dispersion dynamics in Phase 2 were primarily driven by the global financial crisis. Its drivers are the same as what has already been observed when dispersion peaked on June 5, 2009.

Phase 3 was the decade of steady economic recovery and prolonged accommodative monetary policy. This rising tide lifted all boats. While there were winning and losing stocks on various days, sector performance dislocations to the extent observed in the aftermath of the dot-com bust and during the global financial crisis were rare. Consequently, dispersion settled at around baseline levels.

The onset of covid-19, the rapid monetary expansion that ensued to counteract the health crisis, and the spike in inflation that followed as the world came out of lockdowns set the context for higher and more volatile dispersion in Phase 4 than what was witnessed in the previous decade. Following the covid-19 crash (Exhibit 13), technology and communication services sectors rocketed upward as the outlook for stay-at-home tech brightened. In contrast, with the world in lockdown, energy traded sideways or declined in most of 2020. This divergence explains the initial spike in dispersion. As the world started reopening in 2022, inflation steadily increased and the Federal Reserve started to raise interest rates to fight it. In this backdrop, high-growth tech stocks were repriced downward, whereas energy, the previous laggard, then became a leader. But with the onset of the artificial intelligence boom since 2023, technology has made a comeback, led by stocks like Nvidia. Churns like these between sectors explain dispersion dynamics in Phase 4.

Exhibit 11 Contribution of Securities in the 20% to 25% Weight Interval to US Market Dispersion on June 5, 2009

ISIN	Security Name	Sector Name	Size	Index Weight	Cumulative Index Weight	63-day Return	Squared Return Deviation	Proportion of Total Dispersion	Cumulative Proportion of Total Dispersion
US38259P5089	GOOGLE INC.	Technology	LRG	1.09%	20.81%	43.99%	0.20%	0.01%	6.69%
US1912161007	Coca-Cola Company	Consumer Defensive	LRG	1.08%	21.89%	27.76%	1.38%	0.05%	6.73%
US9497461015	WELLS FARGO COMPANY	Financial Services	LRG	1.02%	22.91%	187.64%	219.48%	7.24%	13.98%
US7170811035	PFIZER INC.	Healthcare	LRG	1.01%	23.92%	15.29%	5.86%	0.19%	14.17%
US0605051046	BANK OF AMERICA CORPORATION	Financial Services	LRG	0.93%	24.85%	278.04%	569.06%	17.14%	31.30%

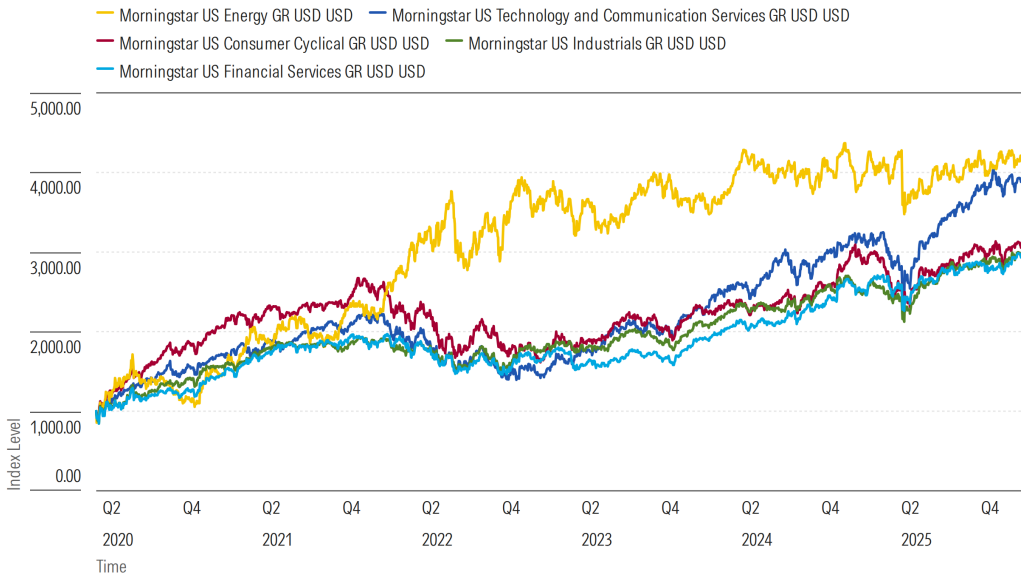
Source: Morningstar. Data as of June 5, 2009.

Exhibit 12 Contribution of Securities in the 55% to 60% Cumulative Weight Interval to US Market Dispersion on June 5, 2009

ISIN	Security Name	Sector Name	Size	Index Weight	Cumulative Index Weight	63-day Return	Squared Return Deviation	Proportion of Total Dispersion	Cumulative Proportion of Total Dispersion
US1510201049	CELGENE CORPORATION	Healthcare	LRG	0.21%	55.15%	7.75%	10.08%	0.07%	38.43%
US3695501086	GENERAL DYNAMICS	Industrials	LRG	0.20%	55.35%	67.11%	7.63%	0.05%	38.48%
US0530151036	AUTOMATIC DATA PROCESSING	Industrials	LRG	0.20%	55.55%	16.95%	5.08%	0.03%	38.52%
US3453708600	FORD MOTOR COMPANY	Consumer Cyclical	MID	0.20%	55.75%	274.12%	550.49%	3.58%	42.10%
US2786421030	EBAY INC.	Consumer Cyclical	LRG	0.20%	55.96%	71.05%	9.96%	0.06%	42.16%
US2441991054	DEERE & COMPANY	Industrials	LRG	0.20%	56.16%	83.62%	19.47%	0.13%	42.29%
US7551115071	RAYTHEON COMPANY	Industrials	LRG	0.20%	56.35%	33.58%	0.35%	0.00%	42.29%
BMG1150G1116	ACCENTURE LTD.	Technology	LRG	0.19%	56.55%	9.07%	9.25%	0.06%	42.35%
US1729671016	CITIGROUP INC.	Financial Services	LRG	0.19%	56.74%	235.92%	385.84%	2.41%	44.76%
US2605431038	THE DOW CHEMICAL COMPANY	Basic Materials	LRG	0.19%	56.93%	151.11%	124.58%	0.77%	45.53%
US25746U1097	DOMINION RESOURCES INC.	Utilities	LRG	0.19%	57.13%	15.51%	5.75%	0.04%	45.57%
US65248E1047	NEWS CORPORATION LTD.	Consumer Cyclical	LRG	0.19%	57.32%	95.16%	30.99%	0.19%	45.76%
US26875P1012	EOG RESOURCES	Energy	LRG	0.19%	57.50%	41.51%	0.04%	0.00%	45.76%
BMG2552X1083	COVIDIEN LTD.	Healthcare	LRG	0.19%	57.69%	28.88%	1.13%	0.01%	45.77%
US6934751057	PNC Financial Services Group	Financial Services	LRG	0.18%	57.87%	127.72%	77.84%	0.46%	46.23%
US26441C1053	DUKE ENERGY CORPORATION	Utilities	LRG	0.18%	58.06%	18.24%	4.52%	0.03%	46.26%
US42809H1077	HESS CORPORATION	Energy	LRG	0.18%	58.24%	8.28%	9.75%	0.06%	46.31%
US7443201022	PRUDENTIAL FINANCIAL INC.	Financial Services	LRG	0.18%	58.41%	259.84%	485.53%	2.80%	49.12%
US8085131055	CHARLES SCHWAB CORPORATION	Financial Services	LRG	0.18%	58.59%	60.01%	4.21%	0.02%	49.14%
US8835561023	THERMO FISHER SCIENTIFIC INC.	Healthcare	LRG	0.17%	58.76%	17.07%	5.03%	0.03%	49.17%
US31428X1063	FEDEX CORPORATION	Industrials	LRG	0.17%	58.93%	60.22%	4.29%	0.02%	49.19%
US9884981013	YUM BRANDS INC.	Consumer Cyclical	LRG	0.17%	59.10%	46.92%	0.55%	0.00%	49.20%
US7445731067	PUBLIC SERVICE ENTERPRISE GROUP	Utilities	LRG	0.17%	59.27%	33.18%	0.40%	0.00%	49.20%
US3729171047	GENZYME CORPORATION	Healthcare	LRG	0.17%	59.44%	14.16%	6.42%	0.03%	49.23%
US0394831020	ARCHER DANIELS MIDLAND CORPORATION	Consumer Defensive	LRG	0.17%	59.61%	8.10%	9.86%	0.05%	49.29%
US4523081093	ILLINOIS TOOL WORKS INC.	Industrials	LRG	0.17%	59.78%	39.52%	0.00%	0.00%	49.29%
US3703341046	GENERAL MILLS INC.	Consumer Defensive	LRG	0.17%	59.94%	3.22%	13.16%	0.07%	49.36%

Source: Morningstar. Data as of June 5, 2009.

Exhibit 13 Evolution of Morningstar US Sector Indexes (TR USD) in Phase 4



Source: Morningstar. Data as of Dec. 31, 2025.

The power of dispersion as a diagnostic tool is evident in how its distinct phases mirror four major US equity market regimes. It effectively captures the transition from the post-dot-com recovery into the systemic shock of the global financial crisis, and then clearly delineates the prolonged calm of the 2010s from the current high-volatility regime. This demonstrates that analyzing the dispersion time series provides a clear and effective lens through which to view shifts in the market's fundamental state.

Conclusion: Dispersion as a Barometer of Internal Market Structure

Portfolio return dispersion holistically captures the ever-changing and multifaceted nature of a broad equity market's internal structure. Empirical evidence from the US market shows that the hum of baseline dispersion has always been driven by relatively smaller companies across various regimes.

In contrast, dispersion behavior during crisis periods demonstrates that not all market stress is created the same. The systemic nature of the 2008 global financial crisis caused the second peak in dispersion to arise from diverse parts of the capitalization spectrum. In contrast, in the immediate aftermath of covid-19, "Stay-at-Home" giants stabilized the top end of the US Market Index, whereas chaos among the smaller "Contact Economy" players became the primary driver of dispersion. Sector wise breakdowns of stock-level dispersion indicate that sector contributions to total dispersion have been balanced in calmer periods but lopsided in crisis-driven periods, with the top contributing sectors changing with the nature of the crisis.

Moreover, the phases identified using the US market dispersion time series neatly overlap with four distinctive regimes of the US equity market: the turbulent yet broad-based recovery following the dot-com crash in the first half of the 2000s, the systemic shock from the global financial crisis in the latter half, the stimulus-fueled prolonged period of market calm of the 2010s, the current volatile regime

sparked by covid-19, its inflationary aftermath, and high-velocity sector rotations. That said, dispersion serves as an effective gauge of shifts in market regimes.

In view of the above, risk managers can derive value from monitoring dispersion levels and their drivers to evaluate regime changes, gauge the effectiveness of intraequity diversification, and model risk accordingly. Active managers can capitalize on high dispersion periods for stock selection, and investors can use dispersion levels to optimize their active-versus-passive allocations. Finally, market strategists can use structural information in dispersion to characterize the state of the market.

In today's market environment, where rapid sector rotations, heightened geopolitical uncertainty, and persistent inflationary pressures are the norm, this paper provides a timely reminder that understanding return dispersion is no longer optional.

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