CAMBRIDGE ASSOCIATES LLC

BEHAVIORAL RISK

2009

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C O N T E N T S

Introduction

Savage bear markets inevitably—and understandably—trigger anguished calls for better "risk management." Risk, however, is like the many-headed Hydra of Greek myth: cut off one head and two quickly sprout in its place.[1] Consequently, the first step in disciplined risk management is to clearly define just what risks one seeks to mitigate, and why, and over what time horizon, and at what potential cost.

This paper focuses solely on *behavioral risk*, which is often overlooked although its management is arguably prerequisite to effective implementation of other risk mitigation strategies. Like all decisions that require our peering into the uncertain future, investment decisions are always based on incomplete information. Nevertheless, given such information as we have, those decisions should be made on the basis of logical, objective, knowledgeable analysis of the facts on hand. They aren't. Instead, we infect them with our personal biases, "gut instincts," irrelevant assumptions, and a veritable Pandora's box-load of all-too-human irrational propensities. Short of turning over our portfolios to computers (been there; done that: garbage in, garbage out!), or to Mr. Spock, we can't hope to eliminate these infections, but we can and should diagnose and contain them.

Our 2000 paper, *Behavioral Finance*, remains a pertinent primer and is recommended as a more thorough discussion of the topic. Here, however, the focus is more specifically on *risk*: that is, what behaviors are most likely to derail effective decision-making during periods of stress? Can we anticipate and counteract these? What steps can we take during periods of relative calm to ensure that we make the best possible decisions when the next storm hits?

Behavioral Responses to Trauma

What happens when we humans (and, indeed, other animals) are slammed by shock? Unless trained otherwise, our instincts tell us to retreat, conserve, seek the comparative safety of groups, and search for a path out of danger. These are ancient survival instincts, hard-wired. Slammed by *financial* shock, the same instincts result in heightened risk aversion (gimme cash!), a dramatic foreshortening of our normal investment time horizon, an overwhelming impulse to flee with the herd, a tendency to extrapolate current trends all the way to Armageddon, and a deep desire to latch on to anyone who seems able to explain what is going on and what will happen next—that is, to alleviate the misery of our deep uncertainty.

Under such conditions, we often make mistakes that cost us dearly: long-term plans are abandoned, rational investment policies discarded, profitable opportunities missed. So the question is: can we train ourselves in some way to override these natural instincts, thus mitigating the risk of making such mistakes next time around?

[1] A more contemporary analogy would be the carnival game whack-a-mole. For example, an endowment fund can easily minimize downside price risk by holding a large percentage of assets in cash and government bonds, but the suppression of this risk increases the risk of self-liquidation if the fund hopes to spend more than 1% per annum (i.e., more than its likely real rate of return).

Countering Behavioral Risks

In times of crisis, when risk aversion spikes, panicked investors tend to stampede for the exits. The temptation to join them is well-nigh irresistible because the whole financial edifice seems to be collapsing. Carefully wrought models are rendered irrelevant overnight, as correlations converge on 1.0, and "fat tail" risk wags the dog. Although no two crises evolve in the same way, the *behavioral response* to crises is relatively uniform, which means we should be able to identify these, recognize which are counterproductive, and figure out how to contain them.

Capital Markets Knowledge

Knowledge is a necessary (if insufficient) foundation for wisdom. But too many trustees of long-term investment funds lack sufficient knowledge of capital market history to make wise decisions. As a result, they tend to overrate the importance of recent information, extrapolate short-term trends, and struggle to distinguish the relevant from the irrelevant in the daily barrage of noise that blankets the investment world. In a crisis, when the level of that noise becomes overwhelming, these tendencies often lead to bad decisions.

When markets are falling, we instinctively feel that risk is rising, and when markets are rising, that risk is ebbing. In the short term, this instinct may be right since markets often run on momentum in the short run. But for long-term investors it is dead wrong. Those responsible for long-term funds therefore need some basic grounding in how and why it is wrong. The most practical way to accomplish this is for quarterly investment committee materials to include a consistent set of long-term charts and graphs that set current conditions in a historical context so that committee members have a framework for understanding the force, depth, and duration of market declines, and thus a first line of defense against uninformed panic (e.g., Exhibits 1–10). Significant asset allocation decisions should never be made without extensive reference to such data so that those panicked by recent events are forced to justify why the historical record should be regarded as irrelevant (i.e., why "it's different this time"). This practice should also counteract the common behavioral traits of overweighting the most recent data, and of focusing only on evidence that supports preexisting beliefs, while ignoring or downplaying evidence that refutes those beliefs.

Time Horizon

During any crisis, investors' time horizons shrink—from decades to days—and their instinctive reaction is to increase liquidity by reducing exposure to long-duration assets and cutting back on commitments to illiquid investments. This is eminently logical—even a vital necessity—for those vulnerable to a liquidity drought (e.g., leveraged investors or those with heavy cash flow needs), but detrimental to unleveraged long-term investors that have no pressing need for cash. As James Montier pointed out in a speech at the CFA Institute's European Investment Conference in Amsterdam in December 2008:

> The more often investors check their portfolios, the more likely they are to see a loss because volatility will become more obvious. These losses trigger the fear system, so the longer investors find themselves in these conditions, the poorer their decision making actually becomes. . . .

> As a fundamental investor, my ability to understand improves as my time horizon extends. For example, consider contributions to total return. With a one-year time horizon, about 28 percent of total return comes from dividend yield and about 12 percent comes from growth in real dividends. Thus, about 60 percent is generated by changes in valuation, which are, in essence, random changes in prices that few, if any, investors can predict. When I extend my time horizon to five years, however, the factors I can understand have a greater impact on total return. Dividend yield and the growth in real dividends account for about 80 percent of total return over five years, and those relatively unpredictable changes in valuations account for only 20 percent of total return. Thus, as investors extend their time horizon, their ability to understand improves.[2]

Consequently, those responsible for overseeing portfolios with long-term investment horizons should resist the instinct to focus on shorter periods in times of crisis. In fact, such circumstances often afford an opportunity to *lengthen* the investment perspective to take advantage of bargain-basement markdowns on less liquid assets.[3]

Of course, most long-term investors have spending needs that oblige them to mediate among competing time horizons; these might be expressed as, for example, 25 years and five years—the former as a yardstick for measuring whether purchasing power is being maintained over the long term, and the latter as a measure of fund performance relative to policy benchmarks. Constant reference to these measures should help counteract the tendency to overemphasize much shorter-term results, especially when volatility spikes and markets plunge.

Portfolio Risk Exposures

A key objective of any investment planning or investment policy review should be determination of a fund's investment risk profile. This should be informed by the financial circumstances of the institution or investor (e.g., financial flexibility, indebtedness, spending and liquidity needs, budgetary dependence on endowment distributions), and more subjective measures of risk tolerance (e.g., effect of losses on trustees, donors). Risk metrics can be more or less complicated (we would recommend less rather than more) and designed for quite different purposes—for example, educating the board, or keeping the investment committee informed, or as portfolio management tools used by professional investment staff.

The key long-term policy risk metric is shortfall risk, which attempts to answer the question: what is the probability that such-and-such an asset allocation will enable us to maintain the real value of our fund, net of spending, over the long term? This kind of risk should be recalibrated whenever policy allocations are reviewed.

Shorter term, however, an investment committee should also see one or two risk metrics designed to counteract the tendency to become more risk-seeking as risk rises and more risk-averse as risk declines. For example, as risk premia across all risky assets all but disappeared from 2005 to 2007 as a result of the

[2] James Montier, "Applied Behavioral Finance: White Swans, Revulsion, and Value," *Conference Proceedings Quarterly*, (CFA Institute, March 2009), pp. 46–47.
[3] See our May 2009 Market Commentary *A Time for Secondaries?*

universal availability of cheap credit, most investors responded by taking on more risk rather than less.[4] This pro-cyclical tendency could perhaps be countered by reference to analyses that would reveal, for example, whether the portfolio's exposure to equity and credit risks had become greater than that prescribed by investment policy.

Equity Exposure

Among these risks, by far the most important is the portfolio's equity exposure. It is axiomatic among seasoned investors that equity markets regress to their mean. But this is wrong: markets regress from high to low, passing through the mean en route; then they reverse, moving from low to high—the mean is just a milepost along the way. Although nobody rings a bell at the top or a gong at the bottom, capital markets history does at least tell us when we have reached, or perhaps passed, relatively extreme points in the likely distribution of returns and valuations, and if our risk profile is predicated on the level of risk implicit in asset classes at mean prices and valuations, we should be able to recognize these extremes and rebalance our risk exposure accordingly.

But crises exacerbate behavioral risks. As equity markets plummet, investors' risk aversion rises even as the fundamental risk is in fact declining.[5] When markets soar, investors' sense of risk recedes as they worry more about missing the boom than protecting against the bust to come. The solution is simple in theory, but difficult in practice: determine how much equity exposure is appropriate for the fund over the long term, *relative to equities at fair value* (e.g., at mean prices and valuations), and as markets rise and fall adjust that exposure to maintain a constant equity risk profile. The practical difficulty is a classic agency/principal problem: the time horizon of the agents (e.g., an investment committee, professional investment staff) is far shorter than that of the institution. Thus, for example, this approach would have resulted in an accelerating reduction in equity exposure during the late 1990s, as markets soared, and a sharp increase in equity exposure after the dot-com boom had bust. And over, say, the ten years from 1995 to 2004, this would have worked very well.[6] However, over the five years from 1995 to 1999 it would have resulted in a steady erosion of performance relative to peers—which might well prove unacceptable to the agents involved.

[4] Howard Marks of Oaktree Capital nails this point in his June 2009 client memo, "So Much That's False and Nutty": "The truth is, risk tolerance is antithetical to successful investing. When people aren't afraid of risk, they'll accept risk without being compensated for doing so . . . and risk compensation will disappear."

[5] This assumes long-term oriented investors that are not highly leveraged (because the greater the leverage, the shorter the investment horizon) and are not in danger of triggering debt covenants or forced to sell to meet pressing liquidity needs.

[6] In fact, as equity risk spiked toward the end of the 1990s, the major endowments effectively followed this process, rebalancing their risk exposure aggressively—but they only did so when market valuations reached unprecedented extremes.

Measurement and Evaluation

Two behavioral tendencies highlighted in all behavioral finance literature are: (1) a propensity to overestimate our own knowledge, ability, and expertise—which may be especially true of groups like investment committees, whose members have generally achieved considerable success in their careers; and (2) a habit of selectively editing our memories of past decisions and results.

As noted in our paper, *Behavioral Finance*: "Investors and investment committees . . . can attempt to counteract the mistakes that are likely to ensue by monitoring how they make decisions, by documenting the rationale for each decision, and by measuring results." This is particularly important during good times, when success seems to confirm our expertise and justify our confidence. We suffer from what James Montier characterizes as "the illusion of control: the belief that if things go wrong, we will be able to sort them out." When that illusion is shattered during a selling panic, we don't know where to turn or what to think. The antidote is to cultivate the humility that comes from continuously evaluating one's decisions; we will learn that we are more subject to market forces than in control of them, and this perspective might enable us to see both good times and bad in their proper context.

Alas! We see very little evidence that most investment committees have taken this advice. By and large, they tend to exhibit persistent overconfidence and make very little effort to determine whether their decisions have in fact added or detracted value, although such objective evaluation is absolutely fundamental to effective investing.

Herding

What others are doing should inform, *but not dictate*, what you do. We have repeatedly warned against the tendency to follow herd leaders (especially evident among endowment funds), regardless of whether their course is best for a particular institution, given its resources, financial needs, and so on. Ben Inker of the investment management firm GMO commented on this problem in response to a question following a speech he gave at the CFA Institute's European Investment Conference in Amsterdam in December 2008: "Investors may have learned the wrong lesson from what the big endowments were doing. The big endowments . . . made the allocations they did because they said to themselves, 'Our comparative advantage is finding alpha . . . and we want to focus on areas where there is the most alpha potential out there.' . . . If you weren't really good at finding alpha, you were going to be disappointed with the returns"[7] if you had simply copied the big endowments' asset allocation. This hits on two important points: first, the idea that investors should exploit their comparative advantage, whatever that is; second, that copying what others are doing will fail if you lack their comparative advantage.

Which takes us back to "Measurement and Evaluation": if you don't measure and evaluate the consequences of your decisions, you can never determine what comparative advantages you possess or lack.

[7] Ben Inker, "Valuation Levels, Market Risk, and Asset Allocation," *Conference Proceedings Quarterly*, (CFA Institute, June 2009), p. 18.

Conclusion

In a crisis, uncertainty explodes, and our sense of control evaporates. The outlook, always foggy at best, becomes impenetrable, heightening our anxiety and often leading us to grasp for the guidance of plausible gurus, even as we know at heart they too are groping in the dark. But if we anticipate our likely reactions to such crises, learning from the research of behavioral psychologists, we can arm ourselves against the mistakes such responses might engender.

The most potent armor is knowledge: if we have a grasp of capital markets history and a sound understanding of where markets stand today relative to their historical trends, we are more likely to buy in than to bail out at the bottom. Similarly, if we have some historical perspective on equity valuations, we have some hope of recognizing when equities are relatively cheap or expensive. Knowing that our time horizon is likely to contract in response to crisis conditions, prodding us into poor decisions, we can train ourselves to focus on more appropriate, longer-term periods by routinely including these in our regular meeting materials.

None of this will be much use, however, unless we have a clear grasp of the major risks we are incurring and some means of calibrating whether these are greater or less than we can tolerate, given our financial circumstances and investment objectives. Routine analyses of portfolio risks should also enable us to recognize and control our own propensity to feel increasingly complacent as those risks become more acute and most panicked when a freefall in the markets has in fact washed a good deal of risk away.

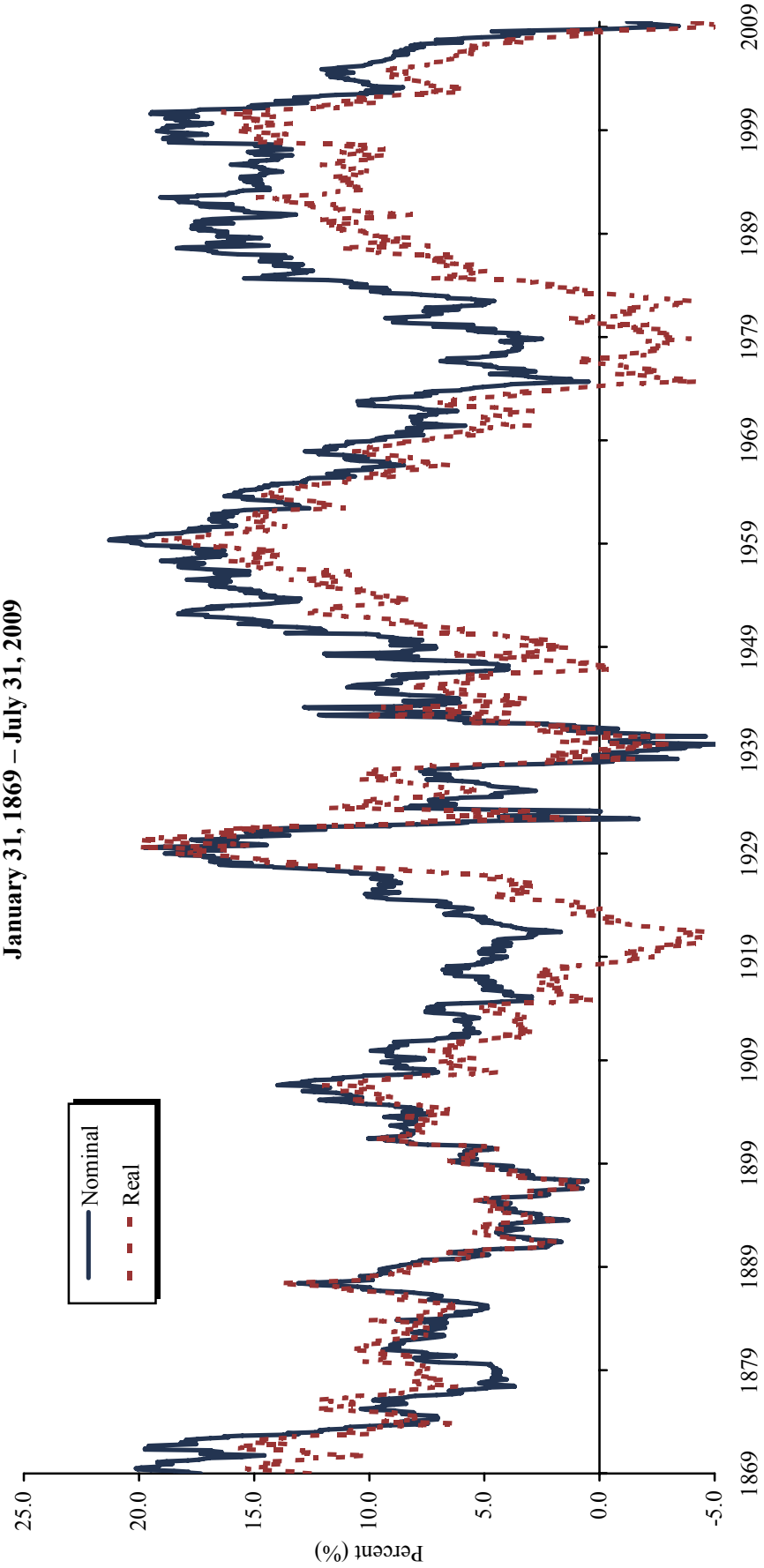
Finally, we can perhaps forestall our instinctive propensity to retreat and conserve in the face of danger by keeping tabs on the efficacy of our decision making over time. Even the most experienced investors regularly make mistakes of commission and/or omission, and nothing is more salutary as a counterweight to overconfidence than an objective record of decisions where such mistakes stare back at us.

EXHIBITS

Exhibit 1

S&P 500 INDEX ROLLING TEN-YEAR AACR

January 31, 1869 – July 31, 2009



Sources: Global Financial Data, Inc., Standard & Poor's, and U.S. Department of Labor - Bureau of Labor Statistics.

Notes: Graph represents total return data. Data prior to 1969 represent the S&P Composite as calculated by Global Financial Data, Inc. Data from 1969 to present represent the S&P 500 Index. CPI-U data are through July 31, 2009.

Exhibit 2

LARGEST MARKET DECLINES

1926–2009

	Market Peak	Market Trough	Bear Market Duration (Mos)	Peak-to-Trough Return (%)	Subsequent Return 1-Month	3-Month	6-Month	1-Year	AACR 5-Year	10-Year
*	Sep-07-1929	Jun-01-1932	32.7	-86.2	-0.1	91.4	51.5	129.5	35.2	11.9
1	Apr-10-1930	Oct-05-1931	17.8	-66.0	9.1	-14.8	-21.8	-10.2	15.9	5.9
2	Nov-09-1931	Jun-01-1932	6.7	-61.8	-0.1	91.4	51.5	129.5	35.2	11.9
3	**Oct-09-2007**	**Mar-09-2009**	**17.0**	**-56.8**	**9.6**	**15.9**	---	---	---	---
4	Mar-06-1937	Mar-31-1938	12.8	-54.5	14.8	38.5	48.6	36.1	13.1	11.8
5	Mar-24-2000	Oct-09-2002	30.5	-49.1	8.8	8.4	5.0	24.4	15.5	---
6	Jan-11-1973	Oct-03-1974	20.7	-48.2	16.8	9.4	34.5	38.1	16.9	15.6
7	Nov-09-1938	Apr-28-1942	41.5	-45.8	7.1	13.9	27.5	61.3	19.5	18.3
8	Sep-07-1929	Nov-13-1929	2.2	-44.7	2.9	12.5	19.5	-17.3	-10.1	-0.5
9	Sep-07-1932	Feb-27-1933	5.7	-40.6	3.9	72.8	100.3	97.5	20.0	12.6
10	Nov-29-1968	May-26-1970	17.8	-36.1	-4.7	7.6	16.1	34.8	7.3	8.3
11	Aug-25-1987	Dec-04-1987	3.3	-33.5	7.6	17.4	16.0	23.3	17.3	18.7
12	Feb-06-1934	Mar-14-1935	13.1	-31.8	10.1	22.8	39.6	83.0	13.0	10.8
13	Jul-18-1933	Oct-21-1933	3.1	-29.8	10.7	25.9	18.9	2.0	13.1	8.5
14	May-29-1946	Jun-13-1949	36.4	-29.6	0.3	9.2	17.1	41.6	23.0	21.3
		Average	16.3	-44.9	6.9	23.6	28.7	41.9	15.4	11.9
		Median	15.0	-45.3	8.2	14.9	19.5	36.1	15.9	11.9

Sources: Global Financial Data, Inc., Ned Davis Research, Inc., Standard & Poor's, and Thomson Datastream.

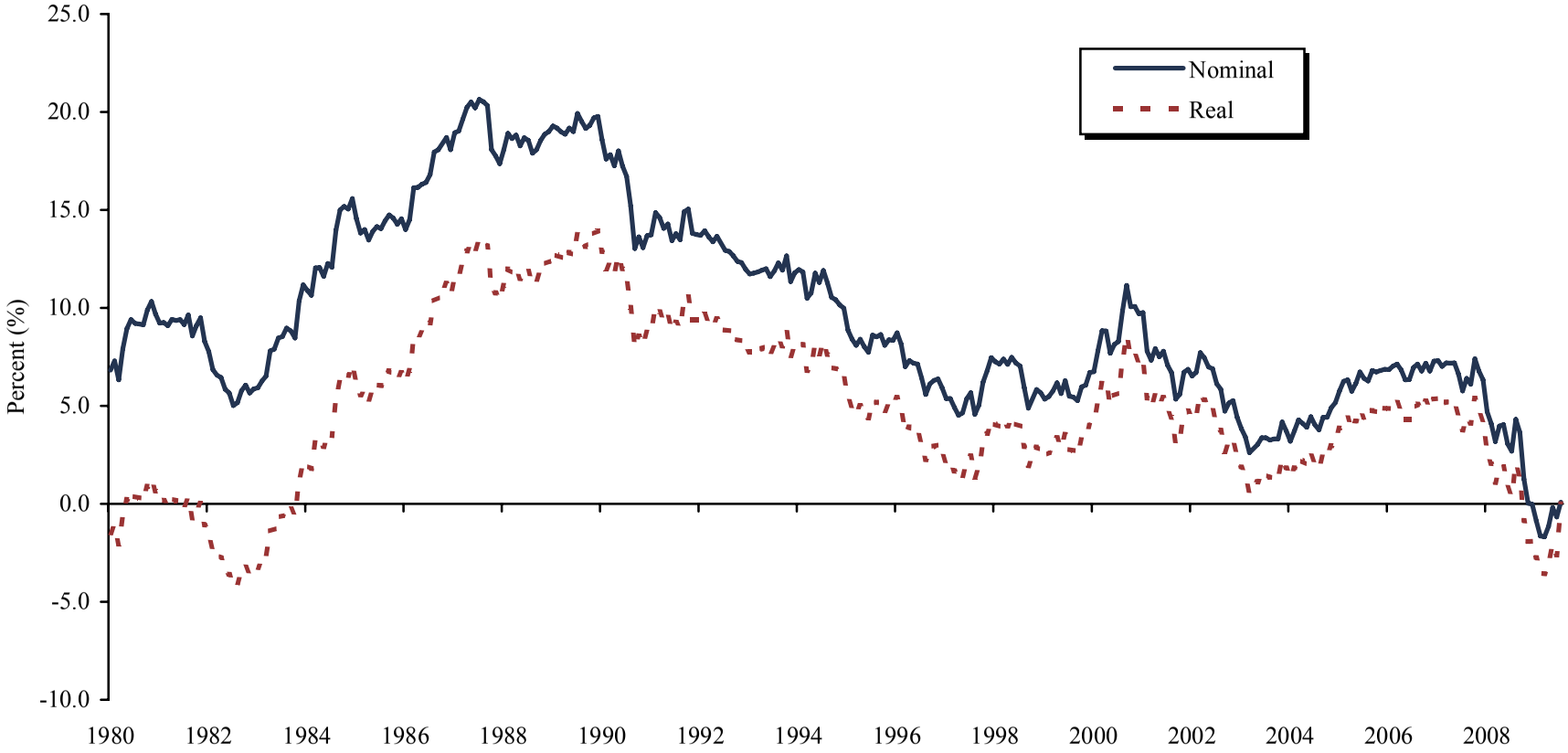
Notes: A "big" bear market is defined as an approximately 30% decline from peak to trough. Subsequent returns based on monthly data beginning at the nearest month-end to the actual market bottom. The period occuring from October 2007 through March 2009 is bolded.

* The 1929–32 bear market is shown here in aggregate, while the 14 bear markets below it include the component sell-offs of September 1929 – November 1929, April 1930 – October 1931, and November 1931 – June 1932.

Exhibit 3

MSCI WORLD EX U.S. INDEX ROLLING TEN-YEAR AACR

January 31, 1980 – July 31, 2009



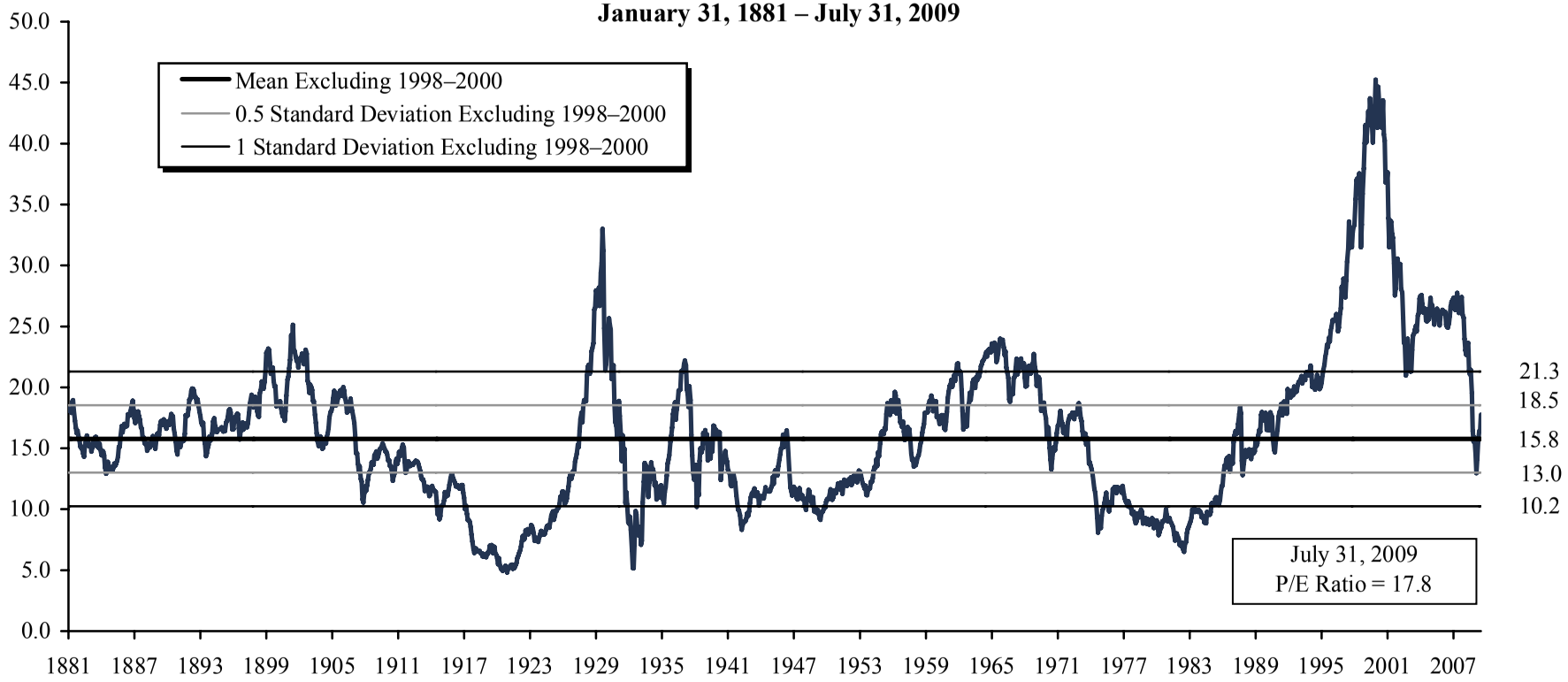
Sources: MSCI Inc. and Thomson Datastream. MSCI data provided "as is" without any express or implied warranties.

Notes: Graph represents total return data and is in local currency units. CPI-G7 data are through June 30, 2009.

Exhibit 4

S&P 500 INDEX NORMALIZED REAL PRICE-EARNINGS RATIOS

January 31, 1881 – July 31, 2009



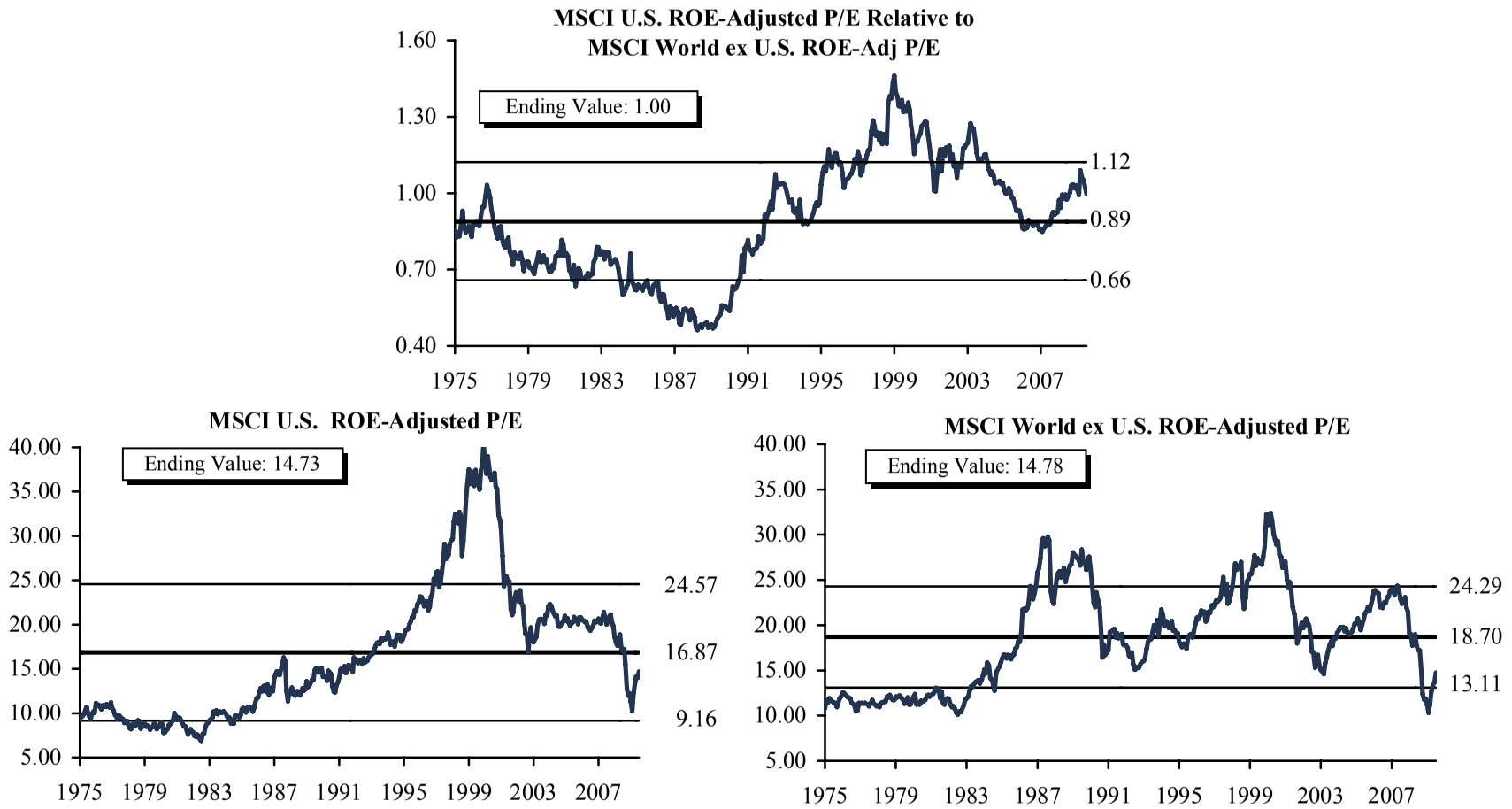
Sources: Robert J. Shiller, Standard & Poor's, and Thomson Datastream.

Notes: The calculation of the mean and standard deviation of real normalized price-earnings (P/E) ratios excludes the 1998–2000 period to minimize the distortion caused by the final years of the technology bubble on long-term valuation norms. Even after excluding this period, standard deviations remain somewhat elevated, with our traditional fair value parameters of 1 standard deviation around the mean containing 68.3% of the P/E observations. Therefore, we use 0.5 standard deviation around the mean to capture fair value. For more information, please see our 2009 report *U.S. Historical Capital Market Valuations.* Graph is based on monthly data. Normalized real P/E ratios (Shiller P/E ratio) for the S&P 500 are calculated by dividing the current index value by the rolling ten-year average of inflation-adjusted earnings. Monthly earnings are interpolated from actual quarterly reported EPS. Real earnings are deflated in terms of June 30, 2009, dollars. Historical data before 1936 provided by Professor Robert Shiller.

Exhibit 5

MSCI U.S. AND WORLD EX U.S. INDEX VALUATIONS

January 31, 1975 – July 31, 2009



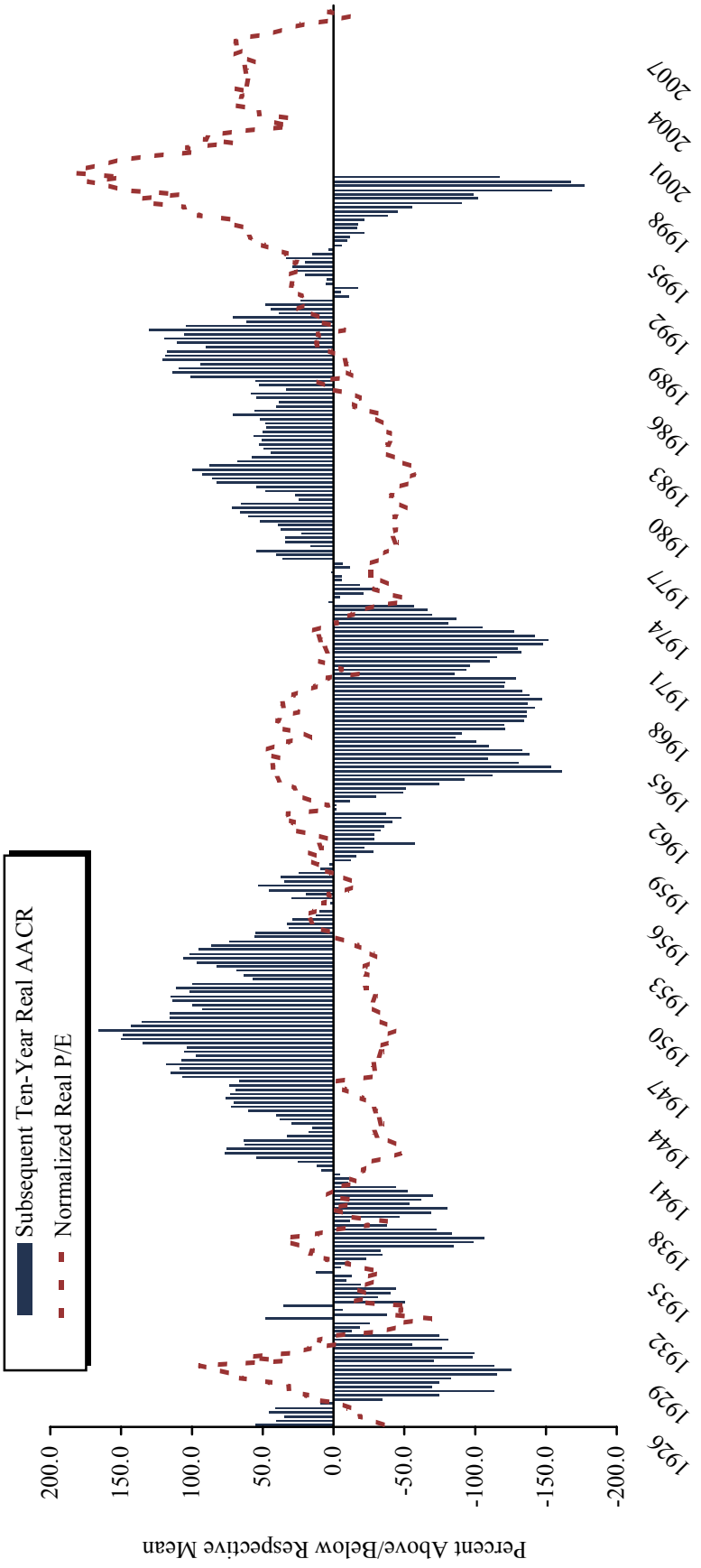
Sources: MSCI Inc. and Thomson Datastream. MSCI data provided "as is" without any express or implied warranties.

Notes: Return on equity (ROE) is calculated by dividing the index's price-to-book ratio by its price-earnings (P/E) ratio. The ROE-adjusted P/E ratio is the current trailing P/E ratio multiplied by the ratio of the current level of ROE to the long-term historical average ROE. All data are monthly.

Exhibit 6

S&P 500 NORMALIZED REAL PRICE-EARNINGS RATIOS AND SUBSEQUENT TEN-YEAR RETURNS

March 31, 1926 – July 31, 2009



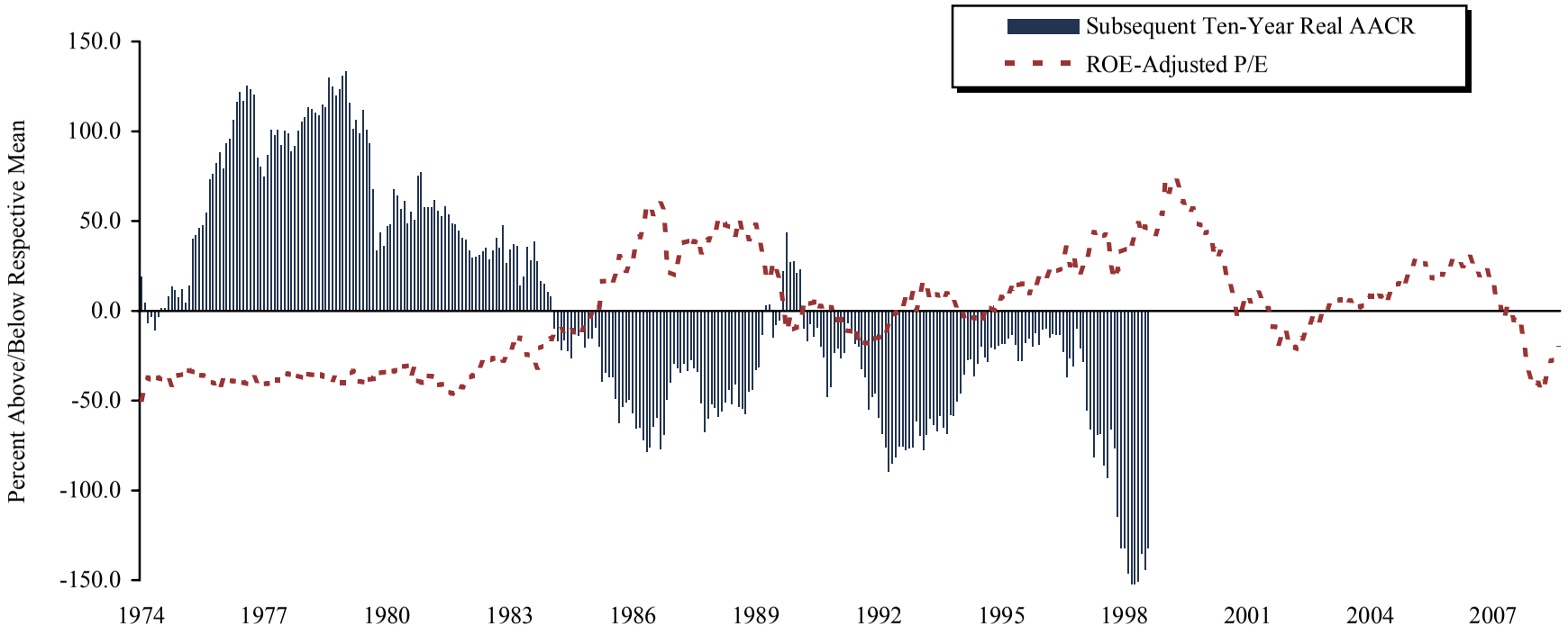
Sources: Robert J. Shiller, Standard & Poor's, and U.S. Department of Labor - Bureau of Labor Statistics.

Notes: Graph shows percent above/below mean for returns and valuations. Line shows point-in-time normalized real price-earnings ratios. Bars show subsequent rolling ten-year real average annual compound returns (AACR) as a percentage of the long-term average ten-year real return of 7.1% since 1926. For example, the first data point shows the real AACR for the period of June 30, 1926 – March 31, 1936. Data are quarterly, except for the most recent period, which is through July 31, 2009.

Exhibit 7

MSCI WORLD EX U.S. ROE-ADJUSTED PRICE-EARNINGS RATIOS AND SUBSEQUENT TEN-YEAR RETURNS

December 31, 1974 – July 31, 2009



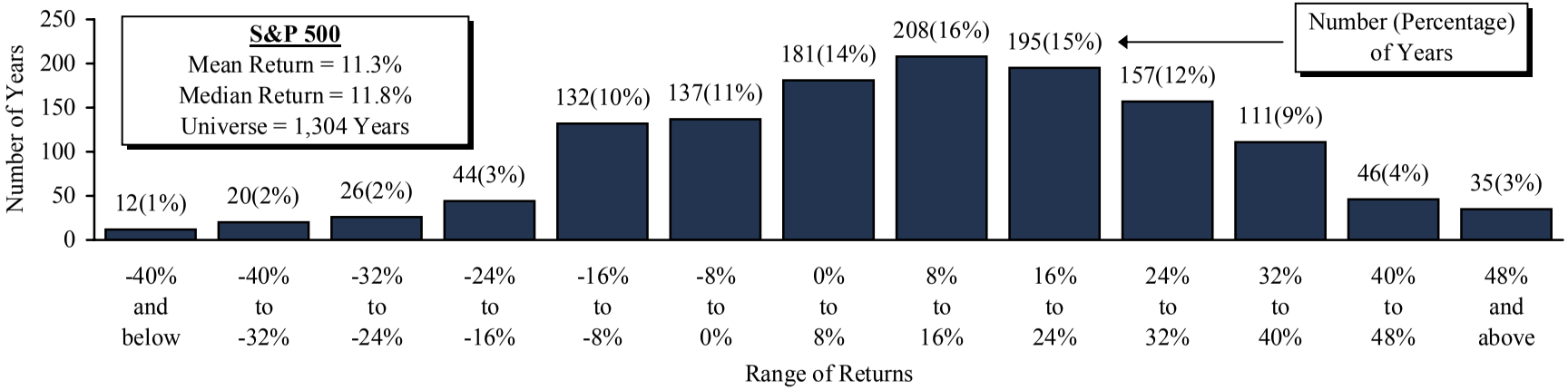
Sources: MSCI Inc. and Thomson Datastream. MSCI data provided "as is" without any express or implied warranties.

Notes: Graph shows percent above/below mean for returns and valuations. Line shows point-in-time normalized real price-earnings (P/E) ratios. Bars are based on monthly data and show subsequent rolling ten-year real average annual compound returns (AACR) in local currency terms as a percentage of the long-term average ten-year real return of 6.0% since December 31, 1974. For example, the first data point shows the real AACR for the period of January 31, 1975 – December 31, 1984. Return on equity (ROE) is calculated by dividing the index's price-to-book ratio by its P/E ratio. The ROE-adjusted P/E ratio is the current trailing P/E ratio multiplied by the ratio of the current level of ROE to the long-term historical average ROE. CPI-G7 data are through June 30, 2009.

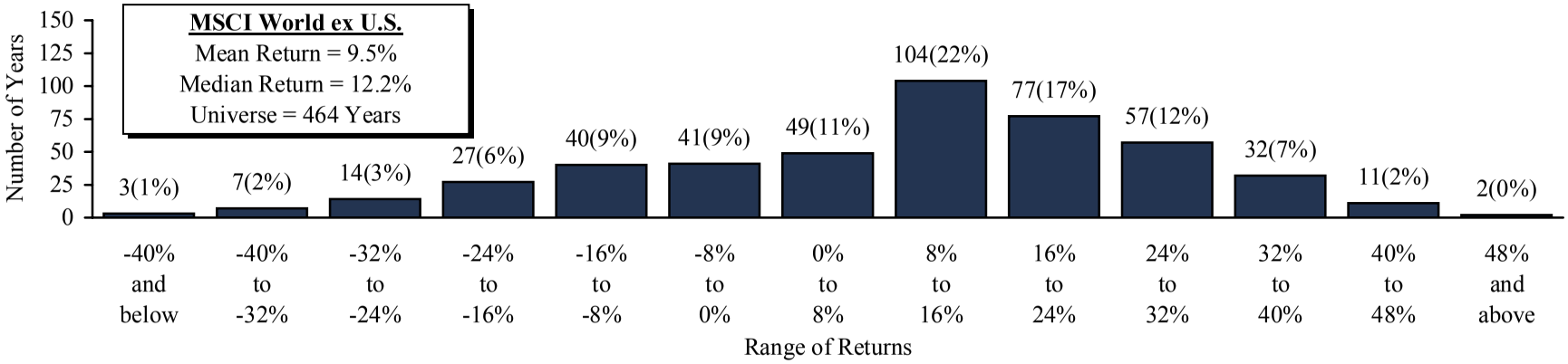
Exhibit 8

DISTRIBUTION OF ANNUAL EQUITY RETURNS ROLLED MONTHLY

December 31, 1900 – July 31, 2009



December 31, 1970 – July 31, 2009

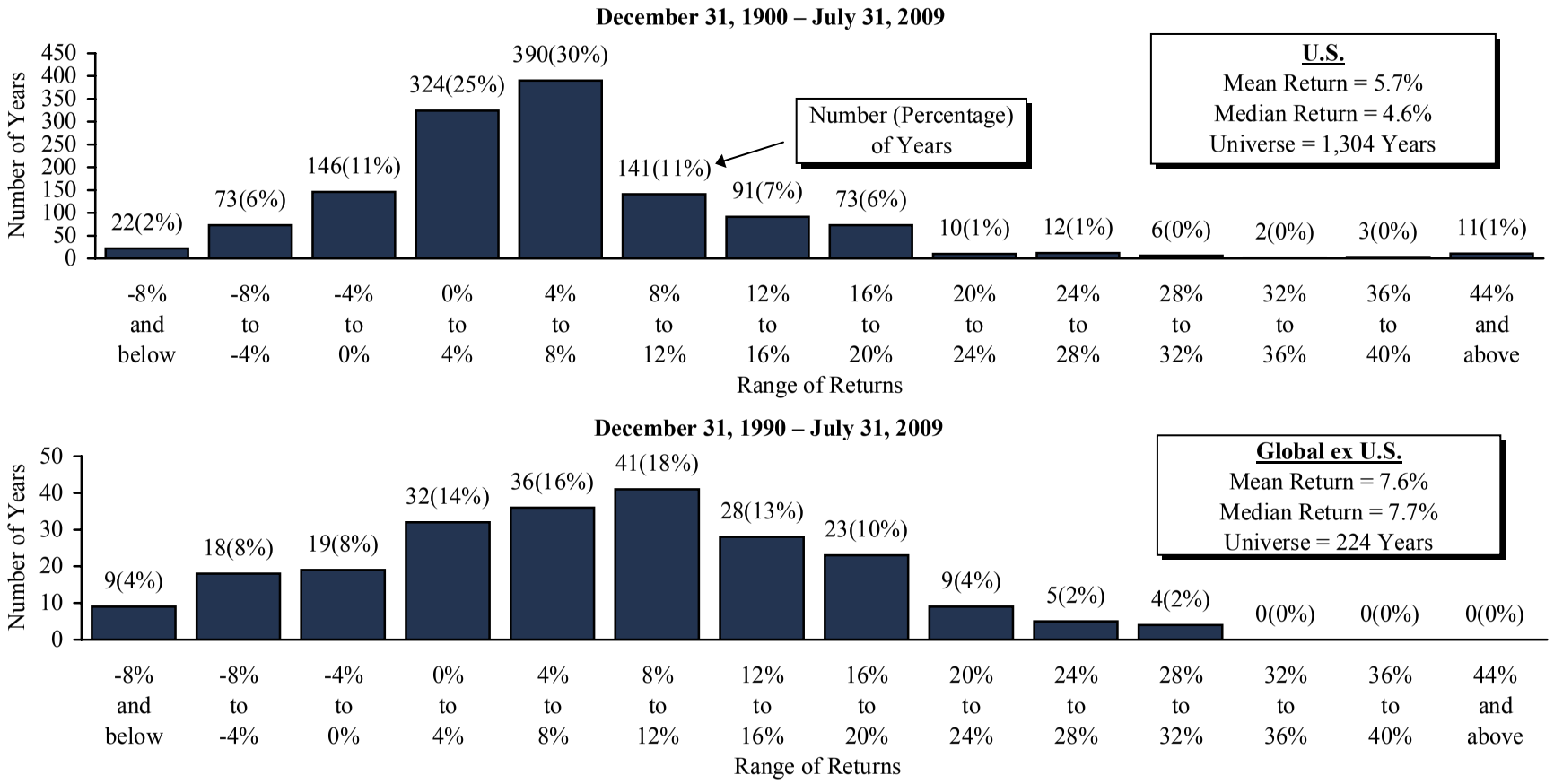


Sources: Global Financial Data, Inc., MSCI Inc., Standard & Poor's, and Thomson Datastream. MSCI data provided "as is" without any express or implied warranties.

Notes: Percentages may not total 100% due to rounding. Total return data are in local currency units.

Exhibit 9

DISTRIBUTION OF ANNUAL BOND RETURNS ROLLED MONTHLY



Sources: Citigroup Global Markets, Global Financial Data, Inc., MSCI Inc., Standard & Poor's and Thomson Datastream. MSCI data provided "as is" without any express or implied warranties.

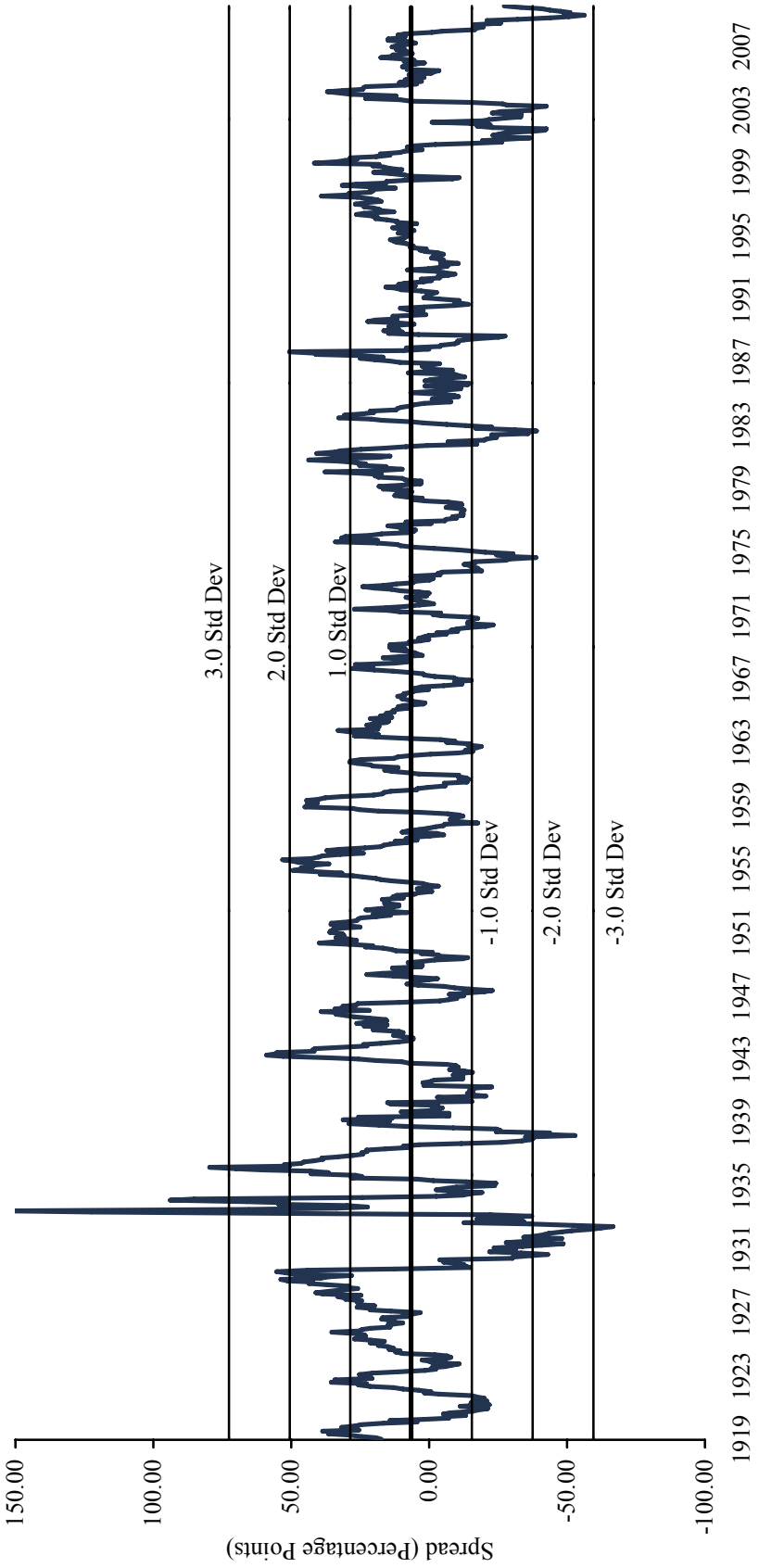
Notes: Percentages may not total 100% due to rounding. The U.S. bond series is composed of Global Financial Data (1900–01), a total return bond index constructed from Standard & Poor's yield data (1902–68), the Salomon Brothers High-Grade Corporate Bond Total Rate of Return Index (1969–79), and the Citigroup AAA/AA Long-Term Corporate High-Grade Bond Index (1980–present). Global ex U.S. bonds are represented by the Barclays Capital Global Aggregate ex U.S. Dollar Bond Index.

Exhibit 10

U.S. STOCK AND BOND RELATIVE PERFORMANCE

January 31, 1919 – July 31, 2009

S&P 500 Total Return (YoY) Less Ten-Year USA Government Bond Total Return (YoY)



Sources: Global Financial Data, Inc., Ned Davis Research, Inc., Standard & Poor's, Thomson Datastream, and U.S. Treasury Department.