

FUND EVALUATION REPORT

Plymouth County Retirement Association

Investment Review
May 30, 2017



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Meketa Investment Group has prepared this report on the basis of sources believed to be reliable. The data are based on matters as they are known as of the date of preparation of the report, and not as of any future date, and will not be updated or otherwise revised to reflect information that subsequently becomes available.

- 1. Initial Observations**
- 2. General Investment Issues**
 - Investment Policy Statement Recommendations
 - Investment Policy Statement Review
- 3. Asset Allocation**
- 4. Disclaimer, Glossary, and Notes**

Initial Observations

Fund Governance

Considerations

1. Review, update or adopt Investment Policy Statements for the Association.
 - In process.

Asset Allocation & Portfolio Construction

Considerations

1. Review current asset allocation policy.

- The current asset allocation policy has a 20-year expected return of 7.6% (with 44% probability of achieving 8.0%).
- This implies that the Association may need to shift its allocation to seek additional return, preferably by accepting as little additional risk as possible.
 - Increase risk / return profile to increase probability of earning the System's target return.
 - Generally, this means reducing exposure to lower returning assets (e.g., bonds) and increasing exposure to higher returning assets (e.g., equities).

2. Evaluate the Funds' aggregate manager structure:

- Consider consolidating similar strategies to simplify manager roster and upgrade where appropriate to reduce fees and improve the likelihood of outperformance.
- Meketa is currently in the process of meeting with and evaluating the Association's managers.

Manager Structure Philosophy

- Once the fund's asset allocation targets are determined, the portfolio roster should be structured to provide the intended exposure to each asset class, to minimize overlap among managers, to provide broad diversification, and to capitalize on the expertise of management firms.
- We recommend a specialist manager structure with each manager performing a well-defined role for the fund. Specialized managers should complement one another, as duplication of investment strategies may reduce efficiency and increase risk.
- A structure in which each manager fulfills a distinct and necessary role increases efficiency, as well as ensures the fund's policies are not reversed by the actions of individual managers.
- For a portfolio that utilizes active managers, the Board should ensure that allocations are sized appropriately, and that the overall success of the plan is not disproportionately impacted by the outcome of a single manager.
- Furthermore, it is essential to review manager roles regularly to ensure that they remain relevant and consistent with the fund's objectives. All investment managers should be monitored continuously to ensure that each fulfills a specific mandate.
- We also recommend reducing the duplication of strategies within a fund. This will simplify the manager roster and reduce unnecessary complexity. Further, the fund may also benefit from lower management fees as assets are consolidated and fee breakpoints are reached.

Initial Observations: Manager Structure

Current Potential Action Items

- Consider terminating McDonnell Foreign Bonds and moving assets to investment grade bonds.
 - Foreign bonds offer little diversification benefits outside of currency exposure.
- Consider replacing/upgrading Denver International Small Cap.
 - We believe there are better options available.
- Consider fully-redeeming Aetos at the September 30, 2017 valuation date.
 - Aetos requires 90 days' notice.

Future Potential Action Items

- Consider adding new complementary global and emerging markets (growth) equity managers.
- Consider using HGK International Equity as a funding source for emerging markets and global equity mandates.
 - A very concentrated all-cap portfolio (35 stocks) can lead to significant dispersion from the benchmark. Strategy overlaps with KBI, and developed stocks a likely funding source for EM/global.
- Consider using both midcap managers as a funding source, and eventually moving the remaining assets to the passive RhumbLine 1000 Value and Growth Funds.
- Multi-Employer Property Trust Core Real Estate and moving assets to PRISA Core Real Estate.
 - Overlapping strategies offer limited diversification benefits.
- Consider replacing/upgrading Franklin Templeton Emerging Market Bonds.
 - We believe there are better options available.

Next Steps: Projected Search Activity

Year	Search	Current Manager(s)	Chapter 176 Requirement?
2017	International Small Cap	Denver	Yes
	Emerging Markets Debt	Franklin Templeton	Yes
	Global Equities	NA	No

General Investment Issues

Investment Policy Statement Recommendations

Investment Policy Statement

An Investment Policy Statement (“IPS”) represents one of the most important governance tools for an asset pool. The written policy serves to identify and formalize the objectives and constraints governing the fund and to establish guidelines for the implementation of investment strategy.

A well-developed IPS thoughtfully merges client-specific goals with the realities of the capital markets. The IPS should be long term and stable in nature, and should focus on core fund-level policy issues. Once established, permanent changes to the IPS should take place only in response to significant changes in the objectives and constraints of the fund. Among other items, the documents should include the fund’s long-term strategic Asset Allocation Policies.

Recommendation:

Meketa Investment Group has reviewed the Association's current Investment Policy Statement and recommends the Trustees consider the following changes as shown below. The Investment Policy Statement should be reviewed periodically by the Trustees to ensure that the objectives and constraints remain relevant.

Generally speaking, Meketa Investment Group believes that elements of the IPS that are subject to change due to varying market and business circumstances (e.g., asset allocation targets and manager specific issues) should be moved to an appendix. This would help to streamline the document to focus on core fund-level policy issues.

Specifically, we believe the Association's IPS could be improved with the following changes:

- Moving the asset allocation components, weights, and ranges to the appendix.
- Moving the Policy Index components and weights to the appendix.
- Updating and moving the list of Fund-level permissible and prohibited investments to the appendix.
- Updating and moving the Assignment of Responsibilities to the appendix.
- Including a set of assumptions guiding the asset allocation decision in the appendix. This exhibit would include expected return, volatility, and correlations for each asset class.
- Changing the Fund's rebalancing policies to state the rebalancing policy should allow for assets to be rebalanced within target ranges.
- Update the Watch List policy and move to the appendix.
- Removing the regulatory language that is subject to change.
- Additional proposed changes include updating the asset class benchmarks and moving manager guidelines to a separate document.

Plymouth County
Retirement Association

Investment Policy Statement

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~~Plymouth County Retirement Association~~
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~~(508) 830-1803, www.per-ma.org~~
~~August 2010~~

Revised May 30, 2017

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August 2010

I. Overview & Purpose

This Investment Policy Statement has been developed to provide a framework around which to manage and monitor the assets of the Plymouth County Retirement Association (the “System”). The purpose of the Investment Policy Statement is to define policies to guide the implementation of the System’s investment goals and objectives in addition to establishing delegations of authority and responsibility, with the end result being effective management and control of the investment process.

The Investment Policy Statement shall:

- Document the System’s objectives and set forth appropriate and prudent policies and guidelines to assist in the achievement of those objectives.
- Provide an investment framework for the System that sets parameters to ensure prudence and care in the execution of the investment program.
- Establish criteria to evaluate the System’s investment performance.
- Communicate investment policies, objectives, guidelines, and performance criteria to the Board, staff, external investment managers, advisors, consultants, custodians and all other interested parties.
- Serve as a document to guide ongoing oversight of the System’s investments.
- Comply with regulations established by the Public Employee Retirement Administration Committee (“PERAC”).
- Document the fulfillment of the overall fiduciary responsibilities of the Board.

This Investment Policy Statement may, from time to time and in writing, be modified as appropriate.

II. Fiduciaries & Standard of Prudence

The Board members are Trustees of the System and are, therefore, fiduciaries. In addition, Consultants, the Board’s Executive Director and staff are also fiduciaries of the System. All fiduciaries shall:

1. Discharge all of his/her duties solely in the interest of members and their beneficiaries for the exclusive purpose of providing benefits to members and their beneficiaries.

~~2. Defray expenses of administering the system.~~

3.2. Act with the care, skill, prudence and diligence under the circumstances then prevailing that a prudent person acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of like character and with like aims.

4.3. Diversify the investments of the ~~system~~ System so as to minimize the risk of large losses, unless it is clearly prudent to do so.

5.4. Adhere to the Massachusetts General Laws and the rules and regulations promulgated by PERAC.

These standards of prudence also apply to other fiduciaries, which include the employees of the System who exercise discretionary authority or control over the management or administration of the System or its assets as well as persons designated by the Board to carry out fiduciary responsibilities including the external investment managers, the general investment consultant, specialized investment consultants, and the custodian.

III. — Duties & Responsibilities

~~The Board is responsible for the general administration and proper operation of the System, including investment of the System's assets. Specific duties and responsibilities of the Trustees, consultants, investment managers and custodians are outlined below in tabular format. However, it should be noted that the Trustees are responsible for all aspects of the System's investments. Trustees may not absolve themselves of this responsibility by assigning specific duties to one or more of these parties.~~

	Board	Consultant	Investment Manager	Custodian
Asset Allocation Investment Policy	✗	✗		
Formation of Investment Policy	✗	✗		
Manager Guidelines	✗	✗	✗	
Manager Selection	✗	✗		
Performance Evaluation	✗	✗		
Compliance with Manager Guidelines	✗	✗	✗	
Execution of Trades			✗	✗
Collection of Dividends & Interest			✗	✗
Cash Sweeps			✗	✗
Recapture Programs	✗		✗	✗
Securities Lending	✗			✗
Proxy Voting			✗	✗

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Trading Verification			✗	✗
Valuation of Securities			✗	✗
Performance Calculation			✗	✗

CH.III. Investment Objectives

The investment objective of the System is to fully fund the plan by generating sufficient long-term inflation adjusted capital appreciation while providing sufficient liquidity to meet short-term withdrawal requirements. The Board desires to balance the goal of higher long-term returns with the goal of minimizing contribution volatility, recognizing that these are often competing goals. This [balance](#) requires taking both assets and liabilities into account when setting investment strategy. Therefore, the investment objectives over extended periods of time are to achieve an annualized investment return that:

1. In nominal terms, equals or exceeds the actuarial investment return assumption of the System adopted by the Board. ~~As of this writing, the actuarial rate of return for the System was 8.25%.~~ The Board acknowledges the investment portfolio may achieve higher returns in some years and lower returns in other years.
2. Meets or exceeds the System’s total fund policy index benchmark, which equals the weighted average of the benchmarks for each asset class and the target weightings for each asset class. The policy benchmark enables comparison of the System’s actual performance to a passively managed proxy, and it measures the contribution of active investment management and policy implementation.
3. ~~Over the short term, generates sufficient income to make monthly payroll payments.~~

Commented [SM1]: Payroll can be paid via liquidation if appropriate

The Board members of the System recognize the long-term return requirements of the System and, therefore, short-term fluctuations in value are secondary to the long-term objective.

CH.IV. Investment Restrictions

The System is a Massachusetts Contributory Retirement System and is, therefore, governed by Chapter 32 of the Massachusetts General Laws. [Investment procedures and restrictions stipulated under these regulations must be followed.](#)

~~The Board intends that the assets of the System at all times are invested in accordance with the provisions of Massachusetts State laws and, specifically, 840 C.M.R., the “investment regulations” established and maintained by the Public Employee Retirement Administration Commission (PERAC). The Board will retain legal counsel when appropriate to review contracts and provide advice with respect to applicable statutes and regulations. The System will comply with PERAC guidelines as they refer to prohibited investments under sections 840 CMR 21.00: M.G.L. c. 7, § 50; M.G.L. c. 32, §§ 21 and 23. Except for private equity partnerships, real estate/real asset partnerships and hedge fund of funds, which are approved investments per PERAC regulations, no investments made by the System or by any bank pooled~~

Commented [SM2]: Most of this is statute, can be incorporated by reference

~~fund, mutual fund, group trust, limited partnership, insurance company separate account or other form of pooled investment of any board shall consider any of the following:~~

~~1. Purchases of securities by partial payment of their cost (purchases on margin).~~

~~Sale of securities not owned by the System at the time of sale (short sales).~~

~~Future contracts other than as follows:~~

~~Forward currency contracts may be written against securities in the international portfolio by an investment advisor registered under the Investment Advisers Act of 1940 and who has been the subject of an exemption for international investment.~~

~~Forward currency contracts may be written against securities in an international portfolio to a maximum 25% of the international portfolio non-dollar holdings at market value. Speculative currency positions unrelated to underlying portfolio holdings are strictly prohibited.~~

~~Call options written against securities in the portfolio other than as follows:~~

~~Call options may be written against equity securities (excluding international equities) in the portfolio by a qualified investment adviser registered under the Investment Advisers Act of 1940.~~

~~Call options may be written against equity securities (excluding international equities) in the portfolio to a maximum of 25% of the market value of the equity portfolio (excluding international equities).~~

~~Only options listed on a U.S. registered exchange may be written.~~

~~Purchases of options other than as required to close out options positions.~~

~~Lettered or restricted stock (with the exception of those investments that are leveraged buyout investments).~~

~~Direct investment in mortgages.~~

~~Collateral loans (with the exception of those investments that are leveraged buyout investments), provided, however that boards may participate in so-called "securities lending" programs through a custodian and provided, further, that the lending of securities is limited to brokers, dealers, and financial institutions and that the loan is collateralized by cash or United States Government securities according to applicable regulatory requirement.~~

~~Loans to employees or individuals.~~

~~Direct purchase or lease of real estate.~~

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In Addition, the System's portfolio must also adhere to the following allocations measured as a percentage of the total fund assets:

<u>Asset Class</u>	<u>Target Allocation</u>	<u>Max Alloc. Per PERAC</u>
Hedge Fund of Funds ¹	4.0%	8.0%
Private Equity/Venture Capital ²	7.5%	7.5%
Real Estate ²	10.0%	15.0%
Real Assets ³	3.0%	—

Asset Allocation

The Fiduciaries of the System believe that the return objective can be best achieved by constructing a fully diversified portfolio and maintaining target asset class weights over long holding periods and through all market environments. It is expected that over long holding periods, a diversified strategy will play a critical role in balancing the risks of different markets in which the System will invest and help generate superior risk adjusted returns.

Asset allocation studies will be conducted using an optimization process when there is a change in the investment policy that will not be satisfied by the current allocation. Such a change may be, but not limited to a change in liquidity needs, a fully funded status or the introduction of an asset class in which the System does not currently invest. While the Board acknowledges the limitations and assumptions inherent in conducting an asset allocation study, they will be performed in order to illustrate how changes to the existing allocation will affect the long-term risk and return profile of the Plan.

~~When conducting an asset allocation study, the Board members will first conduct an analysis of the current portfolio, which entails analyzing the structure of the current portfolio and classifying each security held by each manager according to style, capitalization, duration, and sector. The existing allocation will then be used to assess the expected future return, volatility, and yield. Then the allocation will be optimized to assess whether there is a more efficient portfolio in which the Plan could invest to reach its objectives.~~

On an annual basis, the Board reviews its asset allocation policy. At this time, the Board determines whether there have been significant changes with regard to (1) the economic environment, (2) the Board's objectives, and/or (3) other considerations affecting the asset allocation policy, including liquidity needs. If deemed appropriate, the Board will commission an asset allocation study to reassess and possibly

¹The System is permitted to invest up to 4% in a hedge fund of funds manager(s) of its choice while the remaining 4% must be invested with the PRIT fund.
²As a result of a supplementary regulation the System was granted approval on July 7, 2009 to increase its target exposures to private equity/venture capital and real estate to 7.5% and 15.0% of the overall portfolio respectively.
³The System has adopted a target allocation to real assets of 3%, however, as of this writing PERAC does mandate a maximum allocation to real assets.

change its asset allocation policy. Adoption of the asset allocation recommendation requires a vote of the majority of the Board.

Effective January 1, 2010, the System's portfolio target weights at the broad asset class level are as follows detailed in Appendix C.:

<u>Asset Class</u>	<u>Portfolio Target Weight</u>	<u>Policy Range</u>
Domestic Equity	33.0%	28.0% - 38.0%
Foreign Equity	16.0%	11.0% - 21.0%
Total Fixed Income	25.5%	20.5% - 30.5%
Real Estate / Real Assets	13.0%	10.0% - 15.0%
Private Equity	7.5%	5.0% - 10.0%
Hedge Fund of Funds	4.0%	2.0% - 6.0%
Cash	1.0%	0.0% - 3.0%

The portfolio will be allowed to fluctuate at the broad asset class level within the policy ranges noted above in Appendix C. The System will diversify within each of the broad asset classes according to the target weight on the following page. In an effort to minimize the J-curve effect associated with real estate / real assets and private equity limited partnership investments, the System will over commit to these investments by an amount equal to 25-50% more than what is called for by the target weights consistent with the System's annual private market pacing study.

Asset Class Assumptions

<u>Asset Class</u>	<u>Portfolio Target Weight</u>	<u>Expected Return</u>	<u>Expected Risk</u>	<u>Expected Yield</u>	<u>Index Proxy</u>
Large Cap Value	5.50%	9.43%	16.82%	2.65%	Russell 1000 Value
Large Cap Growth	4.50%	8.64%	18.16%	1.72%	Russell 1000 Growth
Mid Cap Value	6.0%	10.70%	17.55%	2.25%	Russell Midcap Value
Mid Cap Growth	5.0%	9.80%	18.90%	1.40%	Russell Midcap Growth
Small Cap Value	6.50%	11.80%	18.77%	1.10%	Russell 2000 Value
Small Cap Growth	5.50%	10.90%	19.44%	0.00%	Russell 2000 Growth

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Int'l Equity-Dev Markets	13.0%	9.80%	17.98%	0.00%	MSCI EAFE Index-\$
Int'l Equity-Emerg Markets	3.00%	12.10%	29.11%	0.00%	MSCI Emerg Free-\$
Intermediate Gov./Corp	14.50%	6.50%	6.20%	6.00%	Barclays Int-Govt./Credit
High Yield Bonds	4.00%	9.00%	11.76%	8.00%	Barclays High-Yield
Int'l Bonds-Dev./Emerg Mkts	7.00%	8.30%	10.90%	7.00%	CITI Non-US WGBI-All\$
Real Estate/Real Assets	13.00%	9.30%	5.61%	0.00%	NCREIF Property Index
Private Equity	7.50%	14.60%	21.40%	0.00%	CAMB-US Private Equity
Hedge FOF	4.00	8.70%	6.55%	0.00%	HFRI Fund of Funds-Comp
Cash	1.00	3.97%	1.80%	4.75%	MERL Ready Assets

IV.V. Rebalancing Policy

The Trustees, The Board and Staff will review the current portfolio weightings relative to the target weighting on a monthly basis or whenever performance reports are disseminated and rebalance as they see appropriate within the target ranges. The decision to rebalance will depend on various factors including but not limited to: the timing and size of the benefit payments, market conditions and the portfolio weightings relative to the policy ranges. Forced scheduled rebalancing to target weights can create unnecessary transaction costs and it is, therefore, not advisable.

In general, cash flows to and from the Association or its investments will be allocated in such a manner as to keep each asset class within its target range.

The Board recognizes that, periodically, market forces may move the PCRA's allocations outside the target ranges. The Board also recognizes that failing to rebalance the allocations would unintentionally change the PCRA's structure and risk posture. Consequently, the Board has established a process to rebalance the allocations periodically.

On at least an annual basis, if any strategic allocation is outside the specified target range, assets will be shifted to return the strategy to the target range. The specific plan for rebalancing will identify those assets that can be shifted at the lowest possible risk and cost, if the rebalancing cannot be accomplished solely by allocating contributions and withdrawals.

The Board also recognizes that the asset allocation represents long-term target ranges and not short-term imperatives. As such, the Board authorizes the Executive Director and Investment Officer to work with the consultant to make transfers among asset classes and managers as long as such transfers do not move asset classes outside target ranges.

CVI.VI. Revenue Enhancing Programs

If deemed appropriate, The Trustees will engage in two revenue enhancing programs to increase the annual cash flows to the System: commission recapture and securities lending.

1. Commission Recapture

The Trustees acknowledge that brokerage commissions are an asset of the System. Further, Trustees recognize that commissions costs are only one component of execution costs and that managers should follow a best execution strategy; trading style, transaction order flow, broker selection decisions and research requirements of the managers should not be adversely affected by the commission recapture program.

Eligible investment managers are encouraged to participate in the commission recapture program, should there be one in place, and provided commission are competitive. Investment managers are not precluded from ~~one~~ using brokerage firms with whom they have a “soft dollar” arrangement, provided said firms offer competitive execution services.

2. Securities Lending

The securities lending program actively lends securities through a single securities lending program to qualified borrowers in order to provide incremental income to the System. Borrowers in return provide liquid collateral in exchange for the right to borrow securities. Securities shall be fully collateralized at all times. Cash collateral shall be invested in a pool vehicle selected by the Trustees on which interest is paid. A negotiated portion of this interest shall be paid to the borrower while the balance shall be kept by the lending agent and the System.

CVI.VII. Performance Benchmarks

To facilitate the periodic reporting and to provide a relative measure to gauge success, performance benchmarks will be utilized at the broad asset class level and at the manager level. Customized benchmarks will be utilized at the broad asset class level and will be computed as a weighted average of the underlying asset classes in the portfolio. A summary of approved benchmarks is provided below:

Broad Asset Class	Benchmark
Total Portfolio	Customized*
Domestic Equity, International Equity, Fixed Income	Customized* Russell 3000
International Developed Equity	MSCI EAFE
International Emerging Market Equity	MSCI Emerging Markets
Core Fixed Income	Bloomberg Barclays U.S. Aggregate
Value-Added Fixed Income	Bloomberg Barclays High Yield, CSFB Bank Loan Index

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Real Estate	NCREIF ODCE
Private Equity / Venture Capital	State Street Private Equity
Hedge Funds	HFRI Fund of Funds Composite
Cash	Three Month T-Bill

** This index is a weighted average of the underlying asset classes comprising the broad asset class.*

Commented [SM3]: Depending on outcome of asset allocation, may need to change benchmarks

In addition to benchmarks for asset classes, the System employs benchmarks for each one of its investment managers. The individual investment manager benchmarks are approved by the Board ~~and set forth in the investment manager guidelines.~~

CVII.VIII. Investment Manager Selection

The selection and hiring of investment managers, commission recapture brokers and securities lending managers shall be subject to a competitive process that satisfies the Boards' fiduciary duty and meets the requirements of M.G.L. c. 32 and 840 CMR.

- ~~• The investment consultant creates a detailed Request for Proposal ("RFP") questionnaire covering all pertinent quantitative and qualitative issues. All investment managers submitting a bid or proposal to provide services to the Board shall certify, in writing, on the bid or proposal, as follows: "The undersigned certifies under penalties of perjury that this bid or proposal has been submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, club, or other organization, entity or group of individuals."~~
- ~~• The investment consultant will be asked to send the Board the names of investment managers who responded to the RFP and qualify based upon the minimum criteria established by the Board.~~
- ~~• The Board and the investment consultant will review responses to the RFP and eliminate those firms that are not likely to be hired based on the screening criteria. The Board may revise or reaffirm the screening criteria in light of the data gathered.~~
- ~~• The investment manager must be a "qualified investment manager" as defined in 840 CMR 16.01. No person who is not a qualified investment manager as defined by 840 CMR 16.01 shall advise the Board on the purchase and sale of investments or manage the funds of the System.~~
- ~~• The investment consultant will provide a written report as specified by the Board to assist them in reviewing the data.~~
- ~~• The Board will select finalists and conduct investment manager interviews.~~
- ~~• The Board approves the hiring of one or more of the finalists.~~

- ~~The Staff and the Consultant will complete a checklist to ensure that the transition is completed and effective on the official book of record with the Custodian.~~
- ~~Prior to retention of the investment manager, the Board shall notify PERAC that a competitive process that satisfies the Boards' fiduciary duty and meets the requirements of M.G.L. c. 32 and 840 CMR were adhered to.~~
- ~~Prior to the delegation of investment authority to the investment manager, the investment manager must execute a written contract.~~
- ~~The contract must state all terms and conditions of employment including, but not limited to, investment objectives, brokerage practices, proxy voting and tender offer exercise procedures, term of employment, fees and termination provisions.~~
- ~~No contract shall contain a provision that requires the indemnification of the investment manager by the retirement board.~~
- ~~A copy of every contract shall be retained by the board and be subject to audit.~~
- ~~The contract must state that the investment manager is a fiduciary with respect to the fund in which the Board invests pursuant to the investment manager's advice regarding the purchase and sale of investments or the funds that the investment manager manages, as the case may be.~~
- ~~Each investment manager is selected to meet specific investment objectives and/or performance standards.~~
- ~~The investment manager has full discretion to prudently execute investment transactions on behalf of the Plan in accordance with the Board approval of the delegation and guidelines.~~
- ~~Procurement file for each such competitive process and selection shall be maintained by the Board and be subject to audit. The file shall contain the request for proposals, selection process, selection criteria and other information relative to the Board meeting its fiduciary responsibility with respect to the selection.~~

~~This policy statement should make clear that the Trustees are solely responsible for selection, monitoring, evaluation and removal of all investment alternatives made available to the Plan participants. The System may hire consultants and advisors to assist it in these activities; however, nothing changes the ultimate responsibility of the Trustees. While a consultant or advisor may make recommendations for action by the Trustees, the Trustees are free to act in any regard within the scope of its responsibilities with or without prior advice or recommendation from a consultant or advisor. A recommendation from such advisors is not a prerequisite for action by the Trustees.~~

CVIII.X. Portfolio Monitoring Procedures

The Trustees will meet with the Consultant no less frequently than quarterly to review portfolio performance, review portfolio weights relative to target weights and manager's performance. Further, the Board will endeavor to meet with each of its investment managers ~~at least once per year~~ in accordance with PERAC requirements.

The investment managers managing separate accounts on behalf of the System will be issued investment manager guidelines and they will be monitored at two levels of contract review: Watchlist and Probation, the latter being a more heightened level of review.

The Consultant will recommend to the Board ~~members~~ when a manager should be placed on or removed from Watchlist or Probation. When an investment manager is placed on the Watchlist/Probation, it is effective immediately. There is no minimum time requirement on the Watchlist/Probation before a termination may be made. An investment manager's contract may be terminated for any reason at any time, whether on Watchlist/Probation or not.

A representative listing of potential reasons an investment manager may be added to Watchlist/Probation ~~include but are not limited to~~ is detailed in Appendix D:

Organizational Issues (People)

~~Change in ownership or control of the company~~

~~Significant change in team composition or responsibilities~~

~~Material change in the business organization of the investment manager~~

~~Departure of significant personnel~~

Performance

~~1, 3 and 5 year performance net of fees below benchmark~~

~~1, 3 and 5 year performance net of fees below peers (below median of relevant peer universe)~~

~~Performance inconsistent with the investment manager's style and risk control~~

~~Deviation from style~~

Other

~~Material guideline violation not brought to our attention by the investment manager~~

~~Failure to comply with terms of contract that is not corrected within 60 days~~
~~Any extraordinary regulatory action or other proceeding affecting the investment~~
~~Unsatisfactory client service~~

During an investment manager's tenure on the Watchlist/Probation, [the](#) investment consultant will provide the Board with regular reports, including background information and support, about the progress the investment manager is [or is not](#) making. An investment manager may be removed from heightened alert if the Board believes the issues that placed the firm on the Watchlist/Probation are resolved.

Should the manager's performance not improve over a reasonable time period, the Consultant will recommend further action and possible termination after a careful review of the manager's performance, portfolio structure and the market environment. Before a manager is officially dismissed, the Consultant will recommend to the Board a plan of action for managing (internally, externally, or in combination) or liquidating the assets.

Circumstances may warrant that the Trustees take immediate action to terminate a manager. Therefore, the Trustees reserve the right to bypass the course outlined above and remove a manager immediately if deemed prudent and in the best interests of the Plan participants.

X. Investment Costs

[The Board intends to monitor and control investment costs at every level of the System and seek the highest net-of-fee returns.](#)

- [Professional fees will be negotiated whenever possible.](#)
- [Where appropriate, passive portfolios will be used to minimize management fees and portfolio turnover.](#)
- [Where appropriate, assets will be transferred in-kind during manager transitions and System restructurings to eliminate unnecessary turnover expenses.](#)
- [Managers will be instructed to minimize brokerage and execution costs.](#)

CIX.XI. Proxy Voting Policy & Corporate Governance

[The Board recognizes that the voting of proxies is important to the overall performance of the System-. The Board has delegated the responsibility of voting all proxies to the investment managers. The Board expects that managers will execute all proxies in a timely fashion. Also, the Board expects the managers to provide a full accounting of all proxy votes, and upon request, a written explanation of individual](#)

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Plymouth County Retirement Association

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voting decisions. The Board has determined that the investment managers will vote all proxy votes on behalf of the System.

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APPENDIX A

PERMISSIBLE ASSET CLASSES

<u>Asset Class</u>	<u>Purpose</u>
<u>Public Domestic Equity</u>	<u>Total Return Potential</u>
<u>Public Foreign Equity</u>	<u>Total Return Potential</u> <u>Diversification</u>
<u>Private Equity</u>	<u>Total Return Potential</u>
<u>Real Estate</u>	<u>Total Return Potential</u> <u>Diversification</u> <u>Income</u>
<u>Investment Grade Bonds</u>	<u>Return Stability</u> <u>Income</u>
<u>High Yield Bonds</u>	<u>Total Return Potential</u> <u>Diversification</u> <u>Income</u>
<u>Non-U.S. Bonds</u>	<u>Total Return Potential</u> <u>Diversification</u> <u>Income</u>
<u>Private Debt</u>	<u>Total Return Potential</u> <u>Diversification</u> <u>Income</u>
<u>Real Assets</u>	<u>Total Return Potential</u> <u>Diversification</u> <u>Income</u>
<u>Hedge Funds</u>	<u>Total Return Potential</u> <u>Diversification</u>

APPENDIX B

TWENTY-YEAR, SINGLE ASSET CLASS AND SUB-ASSET CLASS FORECAST⁴

<u>Asset Class / Sub-Asset Class</u>	<u>Expected Return</u>	<u>Standard Deviation of Expected 20-Year Annual Return</u>
<u>Cash Equivalents</u>	<u>2.0%</u>	<u>1.5%</u>
<u>Stable Value</u>	<u>3.4</u>	<u>2.0</u>
<u>Short-Term Investment Grade Bonds</u>	<u>2.7</u>	<u>2.5</u>
<u>TIPS</u>	<u>5.3</u>	<u>6.5</u>
<u>Investment Grade Bonds</u>	<u>4.0</u>	<u>6.0</u>
<u>High Yield Bonds</u>	<u>8.5</u>	<u>11.0</u>
<u>Bank Debt</u>	<u>7.0</u>	<u>9.0</u>
<u>Foreign Bonds (hedged)</u>	<u>3.6</u>	<u>6.0</u>
<u>Foreign Bonds (unhedged)</u>	<u>4.1</u>	<u>11.5</u>
<u>Emerging Market Bonds</u>	<u>6.6</u>	<u>12.0</u>
<u>Emerging Market Bonds (local)</u>	<u>5.2</u>	<u>17.0</u>
<u>Core Private Real Estate</u>	<u>7.5</u>	<u>11.5</u>
<u>Public Real Estate (REITs)</u>	<u>7.5</u>	<u>18.0</u>
<u>Natural Resources</u>	<u>11.0</u>	<u>21.0</u>
<u>Timber</u>	<u>6.0</u>	<u>14.0</u>
<u>Commodities</u>	<u>6.6</u>	<u>22.0</u>
<u>Infrastructure</u>	<u>9.6</u>	<u>14.0</u>
<u>Public Domestic Equity</u>	<u>9.4</u>	<u>16.0</u>
<u>Public Domestic Equity (Large)</u>	<u>9.2</u>	<u>16.0</u>
<u>Public Domestic Equity (Mid)</u>	<u>9.5</u>	<u>18.0</u>
<u>Public Domestic Equity (Small)</u>	<u>9.8</u>	<u>21.5</u>
<u>Public Domestic Equity (Micro)</u>	<u>10.5</u>	<u>23.0</u>
<u>Public Foreign Equity (Developed)</u>	<u>9.9</u>	<u>18.0</u>
<u>Public Foreign Equity (Small)</u>	<u>11.1</u>	<u>23.0</u>
<u>Public Foreign Equity (Emerging)</u>	<u>11.6</u>	<u>24.0</u>
<u>Private Equity</u>	<u>11.9</u>	<u>24.0</u>
<u>Hedge Funds</u>	<u>6.2</u>	<u>10.5</u>

⁴ Based on Meketa Investment Group 2017 Asset Study.

APPENDIX B (CONTINUED)
EXPECTED CORRELATIONS AMONG ASSET CLASSES AND SUB-ASSET CLASSES⁵

Asset Class/ Sub Asset Class	Short-Term Investment Grade Bonds	Investment Grade Bonds	TIPS	High Yield Bonds	Public Domestic Equity	Public Foreign Equity (Dev.)	Public Foreign Equity (Em.)	Real Estate	Infrastructure	Private Equity	Hedge Funds
Short-Term Investment Grade Bonds	1.00										
Investment Grade Bonds	0.90	1.00									
TIPS	0.65	0.80	1.00								
High Yield Bonds	0.15	0.35	0.30	1.00							
Public Domestic Equity	-0.05	0.25	0.00	0.65	1.00						
Public Foreign Equity (Dev.)	-0.05	0.20	0.10	0.55	0.80	1.00					
Public Foreign Equity (Em.)	-0.10	0.00	0.10	0.50	0.75	0.80	1.00				
Real Estate	0.10	0.25	0.10	0.50	0.40	0.35	0.30	1.00			
Infrastructure	0.20	0.35	0.30	0.45	0.40	0.35	0.35	0.45	1.00		
Private Equity	0.00	0.15	0.00	0.65	0.80	0.70	0.60	0.45	0.50	1.00	
Hedge Funds	0.10	0.25	0.10	0.50	0.60	0.55	0.50	0.20	0.30	0.55	1.00

⁵ Based on Meketa Investment Group 2017 Asset Study.

Plymouth County Retirement Association

Statement of Investment Policy

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APPENDIX C

ASSET ALLOCATION TARGETS

<u>Asset Class</u>	<u>Portfolio Target Weight</u>	<u>Policy Range</u>
<u>Domestic Equity</u>	33.0% 27.0%	28.0% - 38.0% 22.0% - 32.0%
<u>Foreign Equity</u>	16.0% 20.0%	11.0% - 21.0% 15.0% - 25.0%
<u>Total Fixed Income</u>	25.5% 27.0%	20.5% - 30.5% 22.0% - 32.0%
<u>Real Estate / Real Assets</u>	13.0%	10.0% - 15.0%
<u>Private Equity</u>	7.5% 10.0%	5.0% - 10.0%
<u>Hedge Fund of Funds</u>	4.0%	2.0% - 6.0%
<u>Cash</u>	1.0%	0.0% - 3.0%

Based upon the expected asset returns, risks, and correlations cited in Appendix B, this target allocation exhibits an expected annual return of 7.6% and an expected annual standard deviation of 14.1%.

Plymouth County Retirement Association

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	<u>Board</u>	<u>Consultant</u>	<u>Investment Manager</u>	<u>Custodian</u>
<u>Asset Allocation Investment Policy</u>	<u>X</u>	<u>X</u>		
<u>Formation of Investment Policy</u>	<u>X</u>	<u>X</u>		
<u>Manager Guidelines</u>	<u>X</u>	<u>X</u>	<u>X</u>	
<u>Manager Selection</u>	<u>X</u>	<u>X</u>		
<u>Performance Evaluation</u>	<u>X</u>	<u>X</u>		
<u>Compliance with Manager Guidelines</u>	<u>X</u>	<u>X</u>	<u>X</u>	
<u>Execution of Trades</u>			<u>X</u>	<u>X</u>
<u>Collection of Dividends & Interest</u>			<u>X</u>	<u>X</u>
<u>Cash Sweeps</u>			<u>X</u>	<u>X</u>
<u>Recapture Programs</u>	<u>X</u>		<u>X</u>	<u>X</u>
<u>Securities Lending</u>	<u>X</u>			<u>X</u>
<u>Proxy Voting</u>			<u>X</u>	<u>X</u>
<u>Trading Verification</u>			<u>X</u>	<u>X</u>
<u>Valuation of Securities</u>			<u>X</u>	<u>X</u>
<u>Performance Calculation</u>			<u>X</u>	<u>X</u>

APPENDIX D

WATCHLIST AND PROBATION POLICY

- a. Organizational Issues (People)
- Change in ownership or control of the company
 - Significant change in team composition or responsibilities
 - Material change in the business organization of the investment manager
 - Departure of significant personnel
- b. Performance
- 1, 3 and 5-year performance net of fees below benchmark
 - 1, 3 and 5-year performance net of fees below peers (below median of relevant peer universe)
 - Performance inconsistent with the investment manager's style and risk controls
- c. Deviation from style Investment Process
- Deviation from investment style
 - Deviation from risk controls
- e.d. Other
- Material guideline violation not brought to our attention by the investment manager
 - Material guideline violation not sufficiently explained by the investment manager
 - Failure to comply with terms of contract that is not corrected within 60 days
 - Any extraordinary regulatory action or other proceeding affecting the investment
 - Failure to abide by Massachusetts law and investment restrictions
 - Unsatisfactory client service

Asset Allocation Review

- 1. Background**
- 2. Asset Allocation Overview**
- 3. Asset Allocation Policy Comparison**
- 4. Mean-Variance Optimization**
- 5. Risk Analysis**
- 6. Appendices**

Background

- Asset allocation will influence the Association’s investment results more than any other Board action over the next twenty years. Therefore, it is important to review it frequently.
- This document presents alternative asset allocation options for the Retirement Association.
- We provide various approaches to assessing the risk in each policy option in order to provide a “mosaic” of the risks faced by the Association.
- The goal of this review is not to declare one portfolio the “right” choice or the only prudent choice, but to highlight the risk and return tradeoffs of different policy portfolios.
- Over long periods of time, riskier assets, such as equities, are likely to produce relatively high rates of return.
 - Consequently, higher allocations to risky assets increase the likelihood of the Association achieving its long-term return expectations. However, riskier assets increase volatility in the short term.
- The asset allocation review process highlights the natural tension between long-term goals and short-term risks, and should allow the Association to make more informed decisions regarding portfolio positioning.

Strategic Investment Philosophy

- Meketa Investment Group takes a long-term approach to investing, and recommends that clients focus primarily on strategic asset allocation.
 - Asset allocation will be the largest determinant of a long-term investor's performance.
- By diversifying very broadly to protect against a wide variety of risks, a long-term investor may increase exposure to higher returning asset classes without significantly increasing the total fund's risk profile.
- For long-term investors, Meketa Investment Group favors constructing well-diversified investment portfolios with exposure to higher risk, and higher returning, asset classes.
- Given the historically low interest rates, investing a larger portion of plan's assets in riskier asset classes (including equities, broadly) may be the only way to achieve a fund's targeted return.

Asset Allocation Overview

Asset Allocation

- **What is Asset Allocation?**

- Asset allocation refers to the distribution of assets across a number of asset classes that behave differently from each other over the market cycle. Each asset class exhibits a unique combination of risk and reward. The expected and realized long-term returns vary by asset class, as does the interim volatility of those returns. Some asset classes, like equities, exhibit high degrees of volatility, but also offer high returns over time. Other asset classes, like cash, experience very little volatility, but offer limited return potential.

- **Why is Asset Allocation important?**

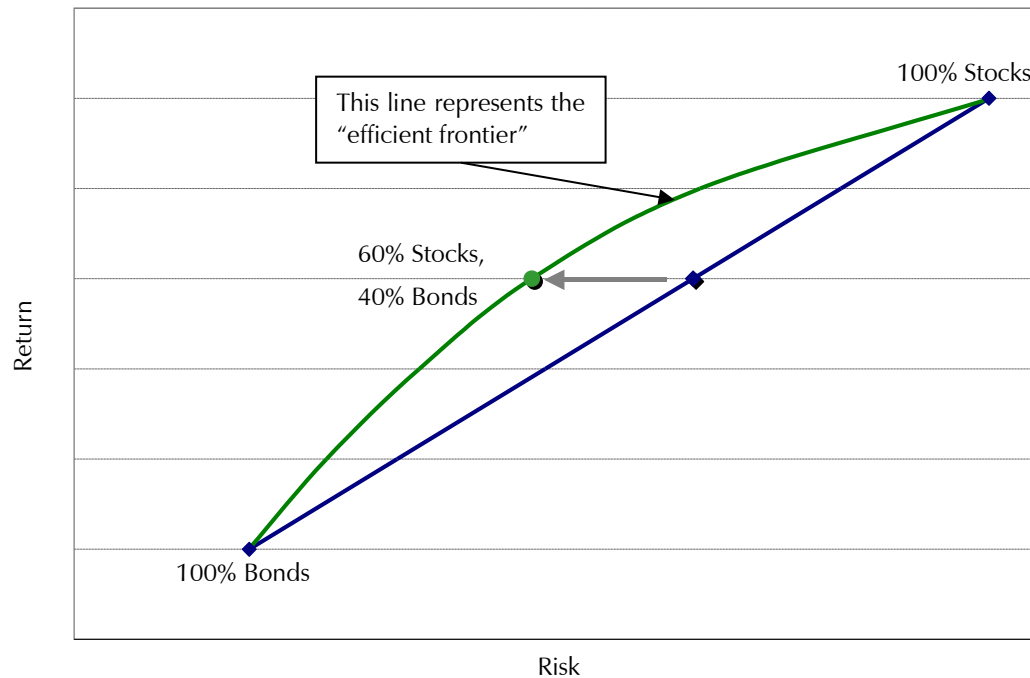
- The distribution of assets across various asset classes exerts a major influence on the expected return and risk of the Fund over short and long time periods.

- **How does Asset Allocation affect Fund performance?**

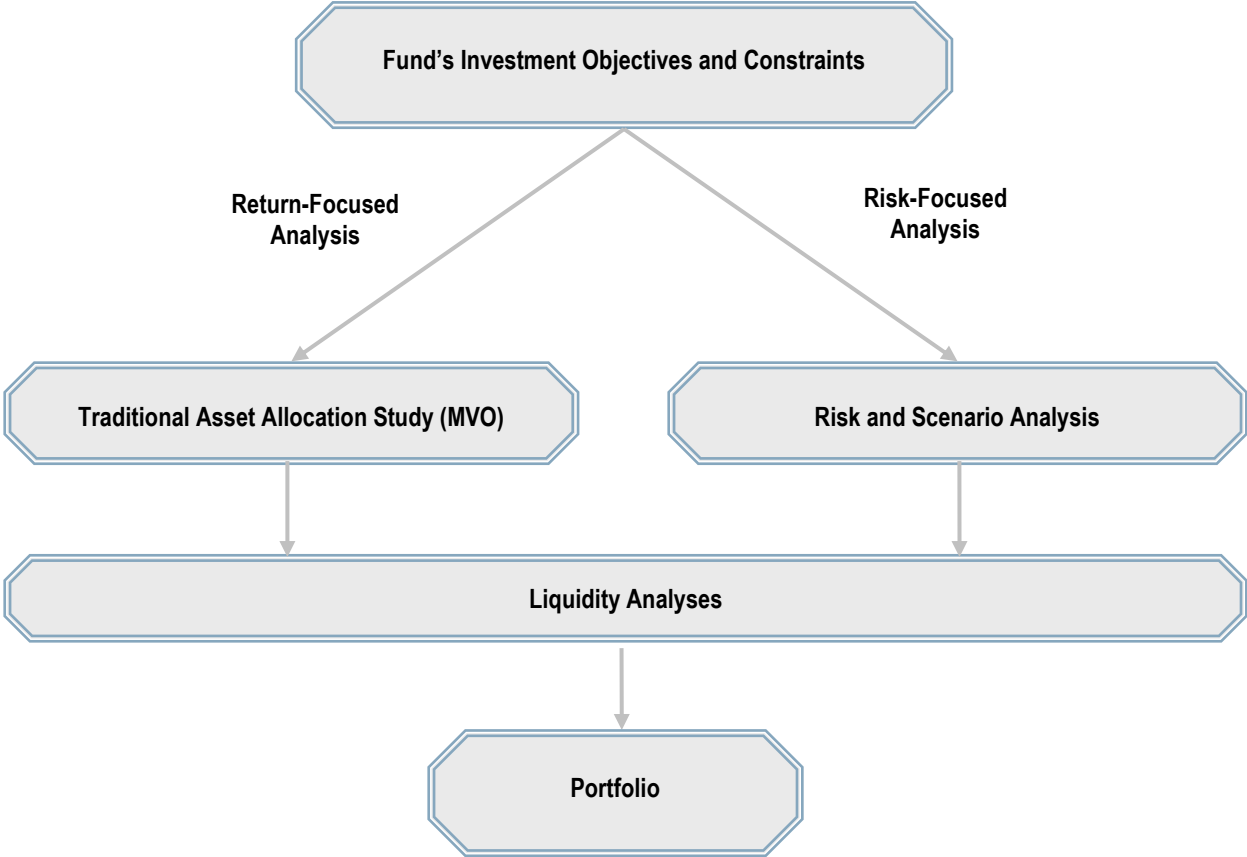
- In addition to exhibiting unique characteristics, each asset class interacts differently with other asset classes. Because of low correlations, the likelihood that any two asset classes will move together in the same direction is limited, with the movement of one asset class often offsetting another's. Combining asset classes allows investors to control more fully the aggregate risk and return of their portfolios, and to benefit from the reduction in volatility that stems from diversification.

Asset Allocation

- **How does prudent Asset Allocation reduce overall volatility?**
 - Each asset class behaves differently—while some asset classes are gaining in value, others may be falling. This varying behavior means that assets are not perfectly “correlated.” As a result of less-than-perfect correlations, combining asset classes allows investors to take advantage of the volatility-reducing benefits of diversification.
 - A properly diversified Fund can expect a higher return for a given level of risk, or, alternatively, can expect lower risk for a given level of return.



Asset Allocation Review Process



What is Risk? Definition and Timeframe Matter

Time Frame	Asset Class	Risk of:			
		Losing Money	Return Volatility	Failing to Achieve Target Return	Failing to Pay Obligations
1 Year	Cash	Low	Low	High	Low
	Equities	High	High	Moderate	Moderate
20 Years	Cash	Low	Low	High	High
	Equities	Low	Moderate	Moderate	Moderate

- Mitigating short-term risk most often favors “conservative” investments, like cash.
- Mitigating long-term risk most often favors “aggressive” investments, like equities.
- The timeframe largely determines which types of strategies/assets best mitigate risk.



Short-Term Versus Long-Term Risk

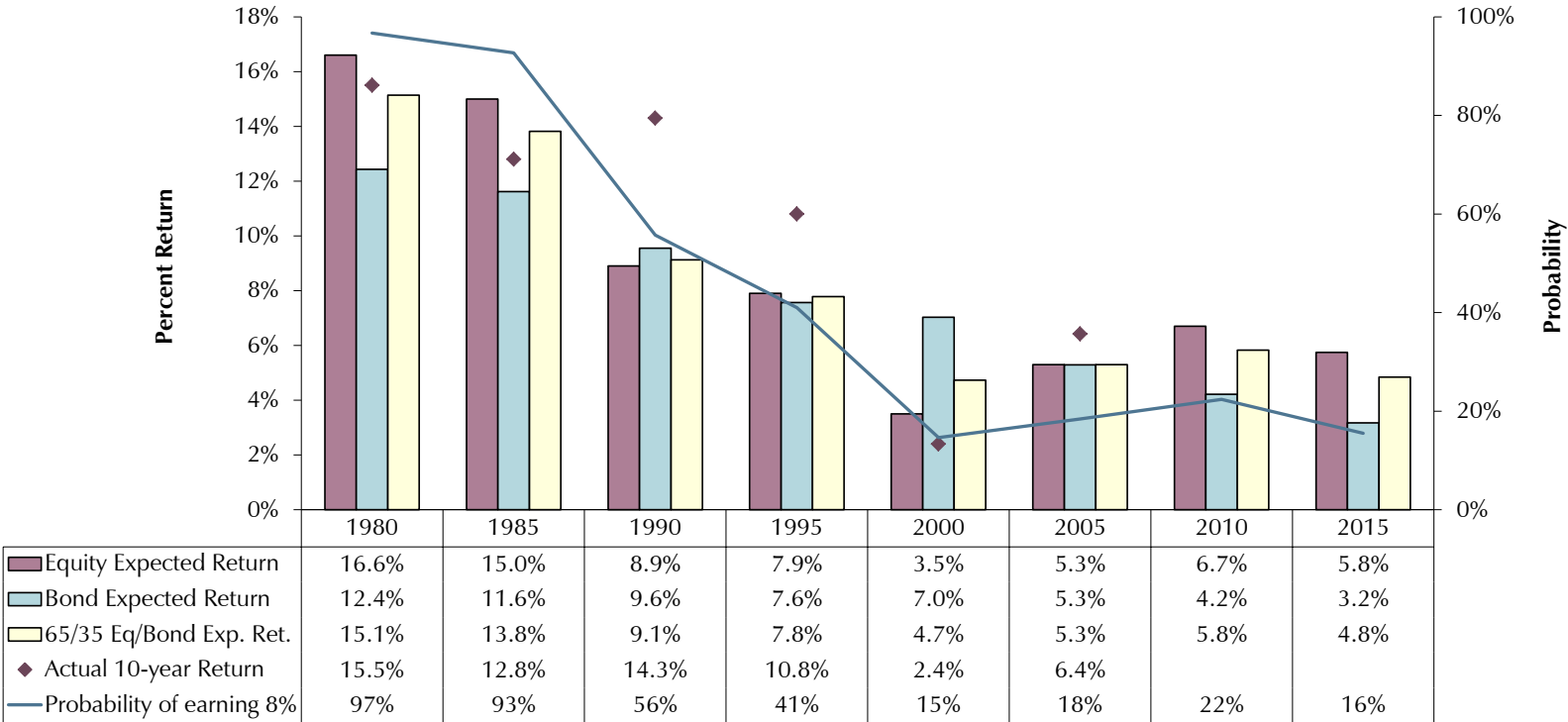
- There is always a trade off in outcomes between portfolios designed to reduce short- and long-term risks.
- For instance, if the concern is reducing short-term risks (such as an extreme equity market pullback), one choice is to reduce equity “risk” or exposure in a portfolio. However, this reduces the long-term return potential of the Fund.
- Therefore, the logical way to reduce the long-term risk of not achieving a target return is to invest in “risk” assets but expect short-term volatility.
- If we define “short-term risk” as a major stock market drawdown of 20% or more, then investors have experienced this type of short-term risk five times since World War II (see table below).

The Top Stock Market Drawdowns Post-WWII

	1962	1973-1974	1987	2000-2002	2007-2009
Drawdown of S&P 500 (%)	-28	-48	-34	-49	-57
<i>Duration of drawdown (months)</i>	6	21	3	31	18
Return of 70/30 portfolio during drawdown (%)	-15	-31	-20	-27	-38
<i>Months to Recover 70/30 portfolio losses after drawdown¹</i>	9	16	14	27	24

¹ 70% invested in the S&P 500 and 30% invested in the Barclays Aggregate.

The Secular Decline in Investment Returns¹



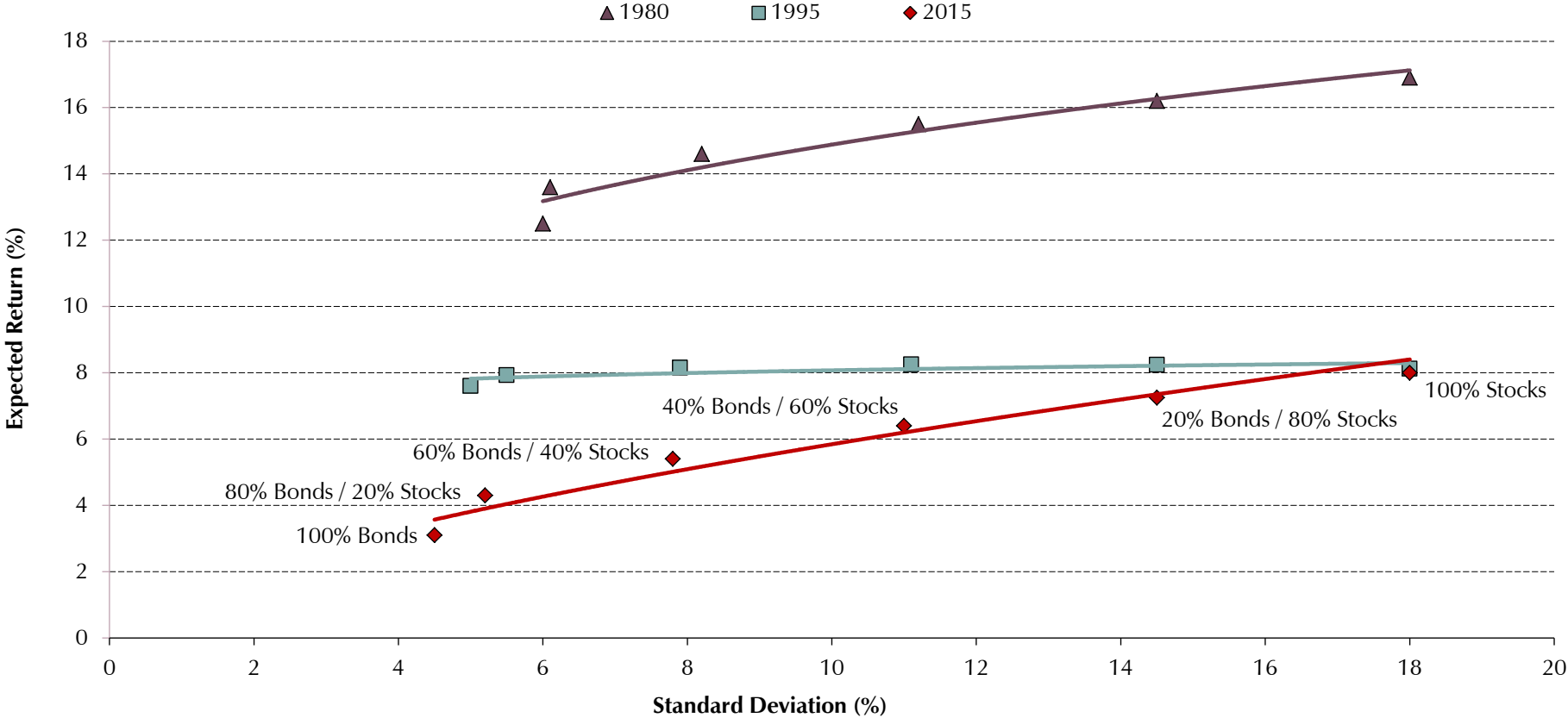
- A portfolio comprised of 65% domestic stocks and 35% investment grade bonds has diminishing expected returns as well as actual returns over the past thirty years.

¹ Expected return assumptions for 1) Bonds equals the yield of the ten-year Treasury plus 100 basis points, and 2) Equities equals the dividend yield plus the earnings yield of the S&P 500 index (using the inflation-adjusted trailing 10-year earnings). Probability calculation is for the subsequent ten years.



The Long View: Less Return for the Risk

- As return expectations have declined, the efficient frontier has shifted down. Hence investors need to accept considerably more risk to target the same returns they could have achieved historically.



Performance Chasing Detracts Value¹

- Investors' performance lags actual fund performance due to performance chasing, a practice that effectively translates into buying high and selling low.

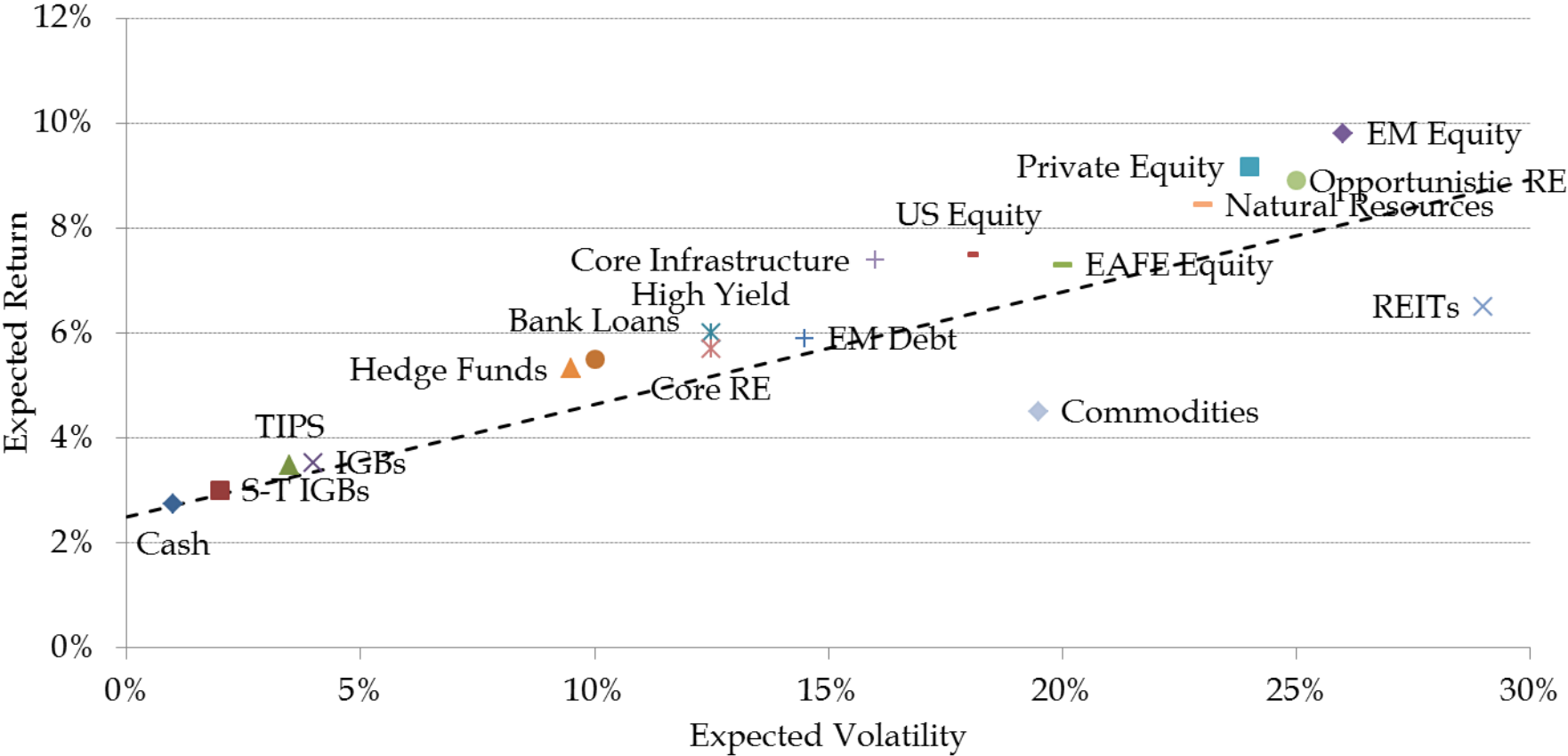
Asset-Weighted and Average Total and Investor Returns: Trailing Through Dec. 31, 2013

	Average 10 Year Total Return (%)	Asset-Weighted 10 Year Investor Return (%)	Returns Gap (%)
US Equity	8.18	6.52	-1.66
Sector Equity	9.46	6.32	-3.14
Balanced	6.93	4.81	-2.12
International Equity	8.77	5.76	-3.01
Taxable Bond	5.39	3.15	-2.24
Municipal	3.53	1.65	-1.88
Alternative	0.96	-1.15	-2.11
All Funds	7.30	4.81	-2.49

Source: Morningstar.

¹ Source: Morningstar. Kinnel, Russel. "Mind the Gap 2014". February 27th, 2014. <http://news.morningstar.com/articlenet/article.aspx?id=637022>

Expected Return and Volatility for Major Asset Classes¹



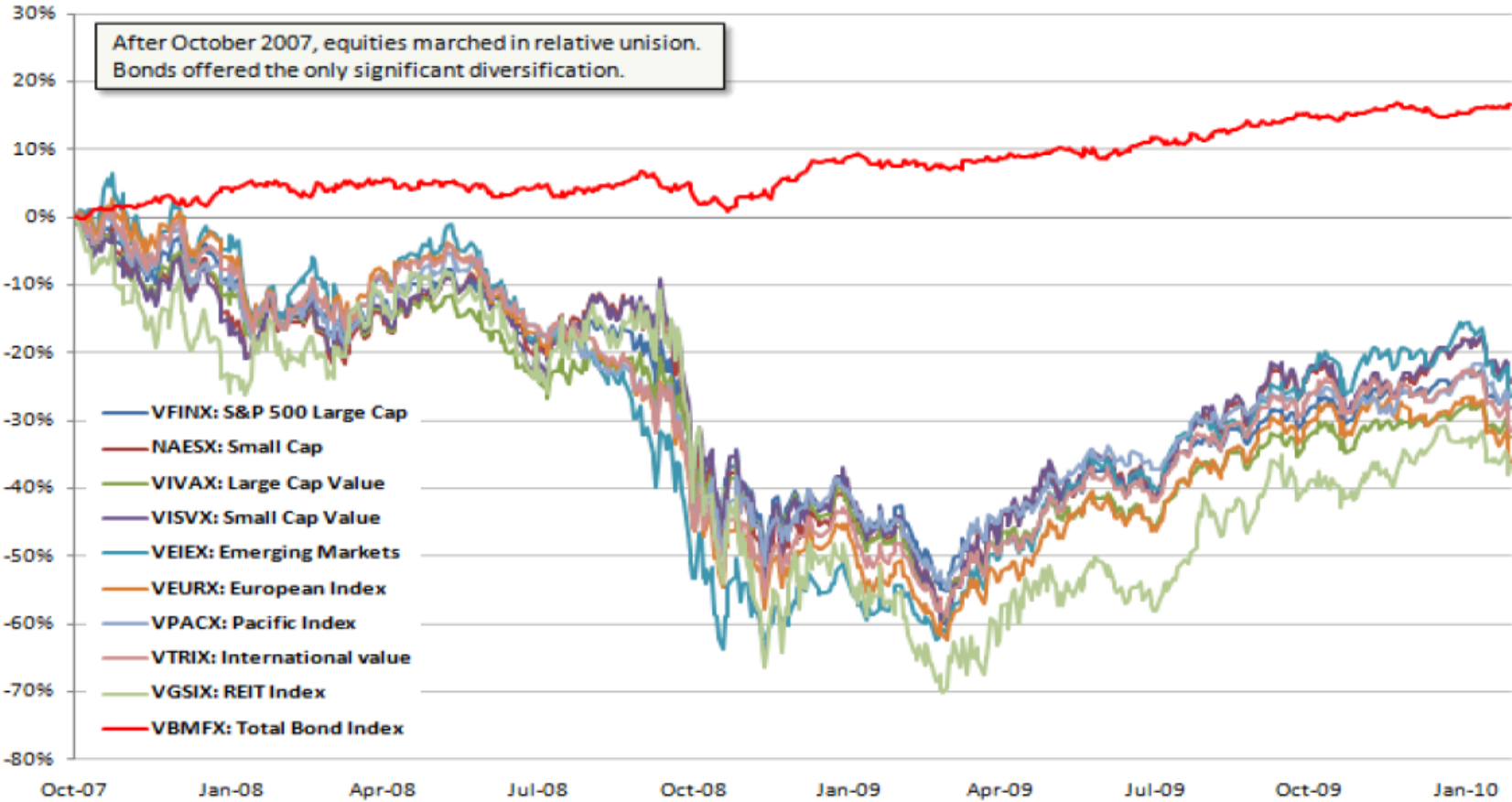
- A positive correlation exists between long-term return expectations and the level of risk accepted.

¹ Expected return and standard deviation are based upon Meketa Investment Group's 2017 Annual Asset Study.



Don't Abandon High Quality Bonds: Diversification Works¹

Asset Class Examples Using Vanguard Mutual Funds



¹ Source: AQR Asset Management



Asset Allocation Policy Comparison

Asset Allocation Policy Options¹

	Current Target (%)	Policy A (%)	Policy B (%)	Policy C (%)
<u>Equities</u>	60	63	66	69
US Equity	27	22	24	26
Developed Market Equity (non-US)	16	8	7	6
Emerging Market Equity	4	8	9	10
Global Equity	0	10	10	10
Private Equity	10	11	12	13
Hedge Fund of Funds	4	4	4	4
<u>Credit</u>	14	12	9	6
High Yield Bonds	4	4	3	2
Bank Loans	3	4	3	2
Foreign Bonds	3	0	0	0
Emerging Market Bonds	5	4	3	2
<u>Rate Sensitive</u>	13	9	9	9
Cash Equivalents	1	0	0	0
Investment Grade Bonds	9	5	5	5
TIPS	3	4	4	4
<u>Real Assets</u>	13	16	16	16
Real Estate	10	10	10	10
Natural Resources	1	2	2	2
Infrastructure	2	4	4	4
Expected Return (20 years)	7.6	8.0	8.1	8.2
Standard Deviation	14.1	15.0	15.3	15.7
Prob. of Achieving 8.0% over 20 Years	44	49	51	52

¹ Expected returns and standard deviations are based upon Meketa Investment Group's 2017 Annual Asset Study. Throughout this document, returns for periods longer than one year are annualized.

Asset Allocation Policy Examples

- The previous page outlines three alternative policies to compare and contrast with the return-risk profile of the Current Policy.
- These policies include differing levels of expected return, ranging from 8.0% to 8.2%.
 - As a result, the level of risk associated with each policy will vary, as well.
- Policy A, with an expected return of 8.0%, meets the expected assumed rate of return.
 - This policy provides the greatest downside protection in the short-term, however long-term the Association may be giving up potential growth of assets.
- Policy B, targeting an 8.1% expected return, has a slightly higher return-risk profile as the Current Policy, with modest changes.
- Lastly, Policy C has an expected return of 8.2%.
 - This policy provides the greatest probability of achieving the assume rate of return, however it will generate more volatility in the short-term.
- The objective of the subsequent analyses is to demonstrate how each policy could perform in various market environments to facilitate the Board's discussion.

Policy Themes

The proposed policies make similar changes that vary by degree across each policy.

- Decrease exposure to fixed income assets broadly.
 - Maintain sufficient liquidity and exposure to high quality bonds.
- Increase exposure to equities broadly.
 - Within equities, increase exposure to emerging markets and private equity.
- Increase exposure to real assets.
 - Increase exposure to private infrastructure and natural resources.

Mean-Variance Optimization

Mean-Variance Optimization

- Mathematically determines an “efficient frontier” of policy portfolios with the highest risk-adjusted returns.
- All asset classes exhibit only three characteristics, which serve as inputs to the model:
 - Expected return
 - Expected volatility
 - Expected covariance with all other assets
- The model assumes:
 - Normal return distribution
 - Stable volatility and covariance over time
 - Returns are not serially correlated
- The MVO Model tends to underestimate the risks of large negative events.

Asset Allocation Policy Options Expected Range of Returns¹

	Current Policy	Policy A	Policy B	Policy C
20-Year Expected Return	7.6%	8.0%	8.1%	8.2%
	<i>High / Low</i>	<i>High / Low</i>	<i>High / Low</i>	<i>High / Low</i>
1-Year	45.2% / -20.4%	48.4% / -21.4%	49.6% / -21.9%	50.8% / -22.4%
20-Years	15.0% / 0.5%	15.9% / 0.6%	16.2% / 0.5%	16.5% / 0.4%

- Over the short-term, the range of potential returns is very wide for each portfolio.
 - Policy C has the widest range of potential outcomes, given the higher standard deviation.
- Over the long-term, the range of potential returns is considerably narrower as overall volatility declines over longer periods.

¹ Assumes 99th percentile expected return for “high” and 1st percentile expected return for “low.”



Asset Allocation Policy Options Expected Growth of Assets¹

	Current Policy (\$ millions)	Policy A (\$ millions)	Policy B (\$ millions)	Policy C (\$ millions)
1-Year	929.1	933.9	935.2	936.6
3-Years	1,000.0	1,013.9	1,017.4	1,021.2
5-Years	1,081.9	1,107.4	1,113.4	1,120.1
10-Years	1,346.8	1,412.7	1,430.7	1,447.3
20-Years	2,270.6	2,517.4	2,581.1	2,646.1

- Over the long-term, as a result of compounding, the additional expected return associated with Policy C is expected to result in significantly more asset growth relative to Policy A.
 - Policy C would produce approximately \$65.0 million more than Policy B over 20 years.
 - Policy B would produce approximately \$63.7 million more than Policy A over 20 years.

¹ Beginning value is \$890.0 million. Assumes each policy option produces its expected return over each period shown and a net yearly withdrawal of \$33 million.

Asset Allocation Policy Options

Range of 20-Year Expected Asset Growth Outcomes¹

Ending Wealth Percentiles	Current Policy (\$ millions)	Policy A (\$ millions)	Policy B (\$ millions)	Policy C (\$ millions)
95 th Percentile (higher value)	6,872.6	8,019.4	8,405.3	8,807.8
75 th Percentile	3,602.7	4,078.5	4,218.9	4,363.6
50 th Percentile (median)	2,270.6	2,489.0	2,552.0	2,616.4
25 th Percentile	1,358.5	1,473.0	1,495.3	1,514.1
5 th Percentile (lower value)	598.2	625.2	623.2	621.3

- The power of compounding turns small differences in average annual returns into large differences in end-of-period values.
- While Policy C offers the largest total range of potential asset growth for the Fund, it would be susceptible to a greater drawdown in a severe equity market decline.

¹ Beginning value is \$890 million. Assumes each policy option produces its expected return over a 20-year period and a net yearly withdrawal of \$33 million.

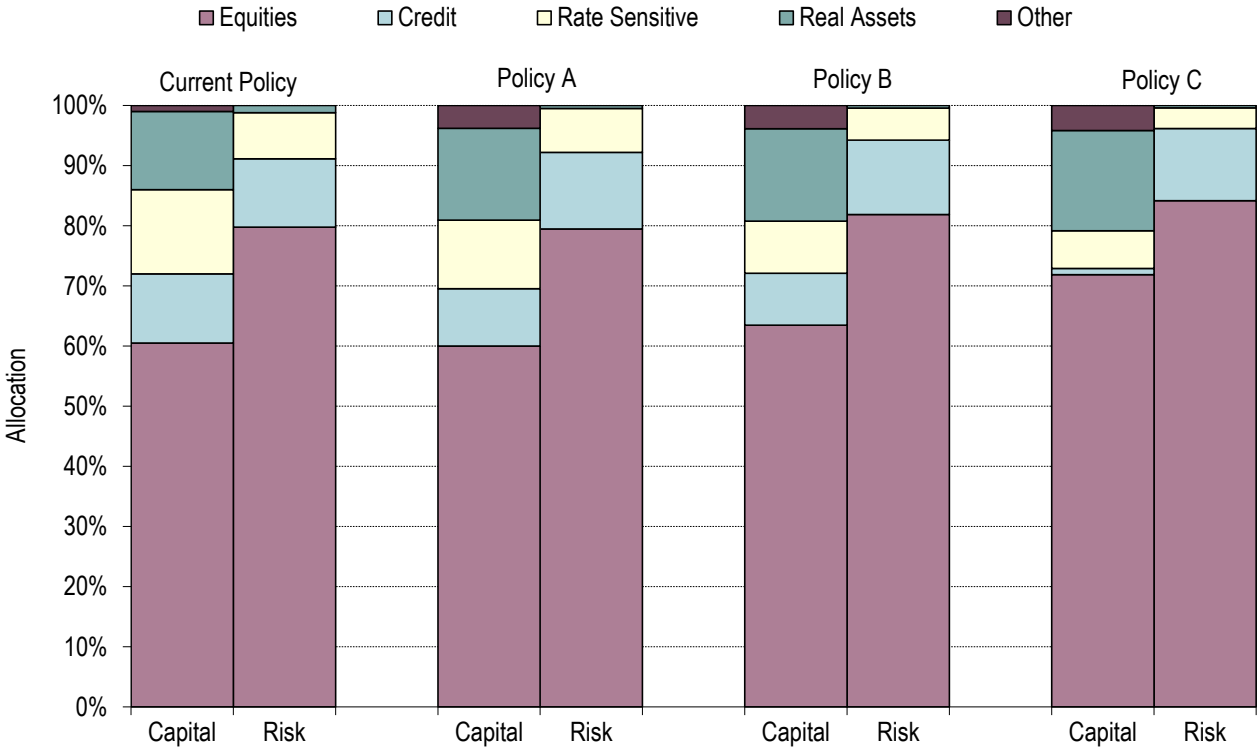
Risk Analysis

Types of Risk Analysis Addressed

- Risk budgeting¹
 - Attributes overall portfolio risks to specific asset classes
 - Highlights the source and scale of portfolio-level risk
- MVO-based risk analytics
 - Includes worst-case return expectations
 - Relies on assumptions underlying MVO
- Scenario analysis
 - Stress tests policy portfolios using actual historical examples
 - Stress tests policy portfolios under specific hypothetical scenarios
- Liquidity Analysis
 - The Fund must maintain adequate liquidity to avoid having to sell illiquid assets at distressed prices to satisfy spending needs

¹ Risk budgeting seeks to decompose the aggregate risk of a portfolio into different sources (in this case, by asset class), with risk defined as standard deviation.

Risk Budgeting Analysis¹ (Capital Allocation vs. Risk Allocation)



- The most significant risk to the portfolio options is equity risk.

¹ Other includes Hedge Funds. Risk allocation is calculated by multiplying the weight of the asset class by its standard deviation and its correlation with the total portfolio and then dividing this by the standard deviation of the total portfolio.



MVO-Based Risk Analysis

Scenario:	Current Policy (%)	Policy A (%)	Policy B (%)	Policy C (%)
Expected Return (20 years)	7.6	8.0	8.1	8.2
Worst Case Returns (0.5)				
One Year	-22.9	-24.1	-24.6	-25.1
Three Years (annualized)	-11.3	-11.9	-12.2	-12.5
Five Years (annualized)	-7.4	-7.8	-8.0	-8.2
Ten Years (annualized)	-3.2	-3.4	-3.6	-3.7
Twenty Years (annualized)	-0.2	-0.2	-0.3	-0.4
Probability of Experiencing Negative Returns				
One Year	28.8	28.8	28.9	29.1
Three Years	16.6	16.6	16.8	17.0
Five Years	10.5	10.5	10.7	10.9
Ten Years	3.8	3.8	4.0	4.1
Twenty Years	0.6	0.6	0.7	0.7
Probability of Achieving at least a 8.0% Return				
One Year	48.6	49.9	50.2	50.4
Three Years	47.6	49.8	50.3	50.8
Five Years	46.9	49.7	50.4	51.0
Ten Years	45.5	49.6	50.5	51.4
Twenty Years	43.7	49.4	50.7	52.0

- Policy A has the lowest probability of achieving an 8.0% return over the long-term relative to the alternative policy options.

Historical Scenario Analysis¹ (Cumulative Return)

Scenario:	Current Policy (%)	Policy A (%)	Policy B (%)	Policy C (%)
Calendar Year 2008	-26.3	-28.7	-29.2	-29.6
Global Financial Crisis (4Q07 thru 1Q09)	-31.3	-33.5	-34.1	-34.7
Interest Rate Spike (1994)	3.2	3.4	3.5	3.7
Crash of 1987 (September thru November 1987)	-11.5	-12.2	-12.6	-13.0
Popping of the dot.com Bubble (2Q00 thru 3Q02)	-15.3	-17.1	-18.1	-19.2
Strong U.S. Dollar (1Q81 through 3Q82)	2.1	1.0	0.8	0.7
Weak U.S. Dollar (January 1986 thru August 1987)	30.6	31.6	31.7	31.7
Stagflation (January thru March 1980)	-5.2	-5.2	-5.1	-5.1
Stagflation (1Q73 thru 3Q74)	-27.9	-29.8	-30.2	-30.6

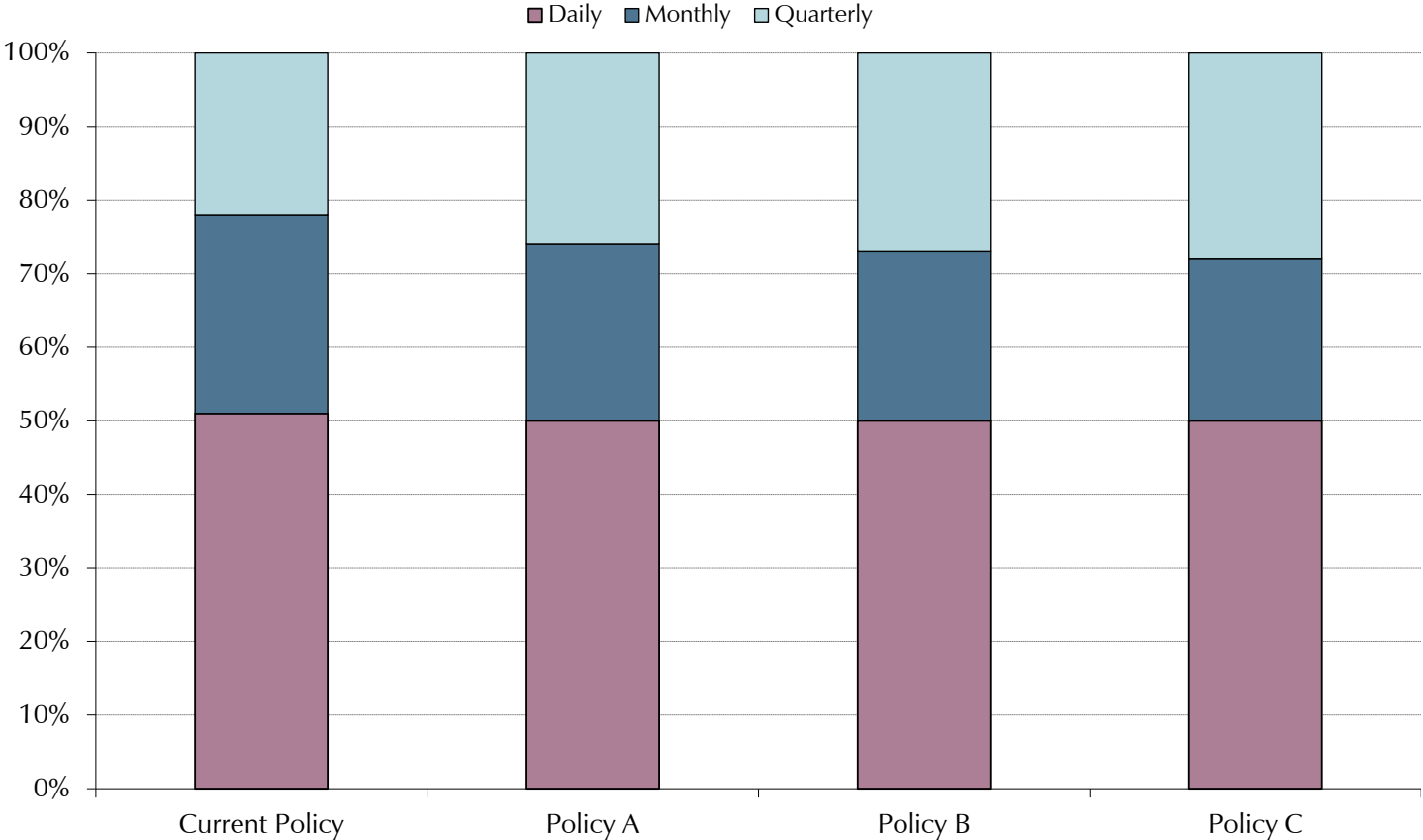
¹ See the Appendix for our scenario inputs. In periods where the ideal benchmark was not yet available we used the next closest benchmark(s) as a proxy.

Stress Testing: Impact of Market Movements (Expected Returns under Stressed Conditions)¹

What happens if (over a 12-month period):	Current Policy (%)	Policy A (%)	Policy B (%)	Policy C (%)
10-Year T-Bond rates rise 100 bp	6.2	6.9	7.1	7.3
10-Year T-Bond rates rise 200 bp	4.4	5.4	5.6	5.8
10-Year T-Bond rates rise 300 bp	1.8	3.1	3.3	3.6
BBB Spreads widen by 50 bp, HY by 200 bp	4.8	5.1	5.3	5.5
BBB Spreads widen by 300 bp, HY by 1000 bp	-28.7	-31.1	-31.7	-32.3
Trade-weighted U.S.\$ gains 10%	1.3	1.3	1.4	1.5
Trade-weighted U.S.\$ gains 20%	2.6	2.6	2.8	2.9
Equities decline 10%	-7.1	-7.6	-7.8	-7.9
Equities decline 25%	-17.8	-19.1	-19.4	-19.8
Equities decline 40%	-28.4	-30.5	-31.1	-31.6

¹ Assumes that assets not directly exposed to the factor are affected nonetheless. See the Appendix for further details.

Liquidity Profile¹



- Each Policy has at least 50% allocated to daily-liquid assets.

¹ For this analysis, we assume that hedge funds and half of the real estate allocation provide quarterly liquidity, and closed-end private market funds are illiquid.



Appendices

Notes and Disclaimers

- ¹ The returns shown in the Policy Options and Risk Analysis sections rely on estimates of expected return, standard deviation, and correlation developed by Meketa Investment Group. To the extent that actual return patterns to the asset classes differ from our expectations, the results in the table will be incorrect. However, our inputs represent our best unbiased estimates of these simple parameters.
- ² The returns shown in the Policy Options and Risk Analysis sections use a lognormal distribution, which may or may not be an accurate representation of each asset classes' future return distribution. To the extent that it is not accurate in whole or in part, the probabilities listed in the table will be incorrect. As an example, if some asset classes' actual distributions are even more right-skewed than the lognormal distribution (i.e., more frequent low returns and less frequent high returns), then the probability of the portfolio hitting a given annual return will be lower than that stated in the table.
- ³ The standard deviation bars in the chart in the Risk Analysis section do not indicate the likelihood of a 1, 2, or 3 standard deviation event—they simply indicate the return we expect if such an event occurs. Since the likelihood of such an event is the same across allocations regardless of the underlying distribution, a relative comparison across policy choices remains valid.

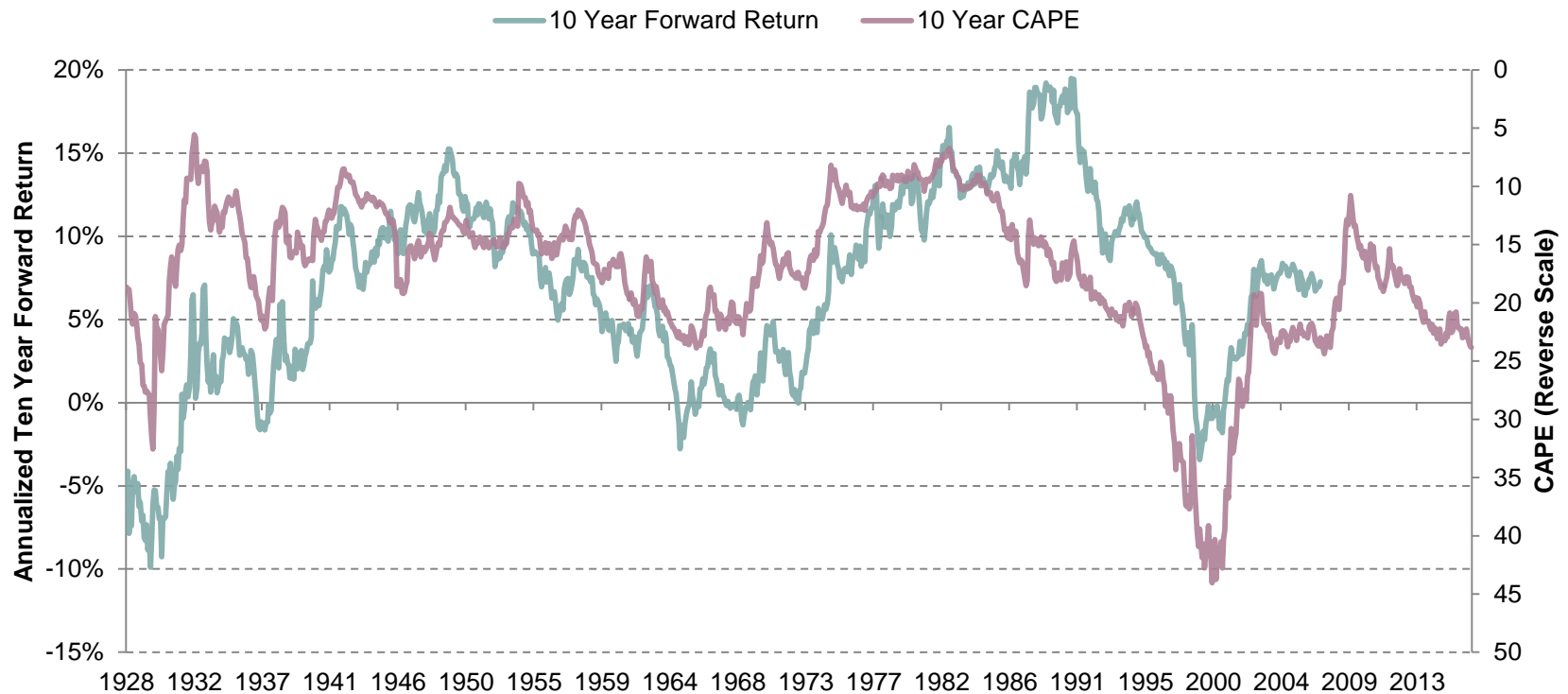
U.S. Equity Cyclically Adjusted P/E¹



- As of April 13th, the cyclically adjusted P/E ratio for the S&P 500 was 26.2x which is above its post-WWII average of 20.7x.
- Historically, a P/E ratio at this level has led to below average future returns over a 10 year horizon.

¹ Source: Standard & Poor's. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years. Data is from January 31, 1946 to April 13, 2017.

The U.S. Cyclically Adjusted P/E¹ and Long-Term Equity Returns



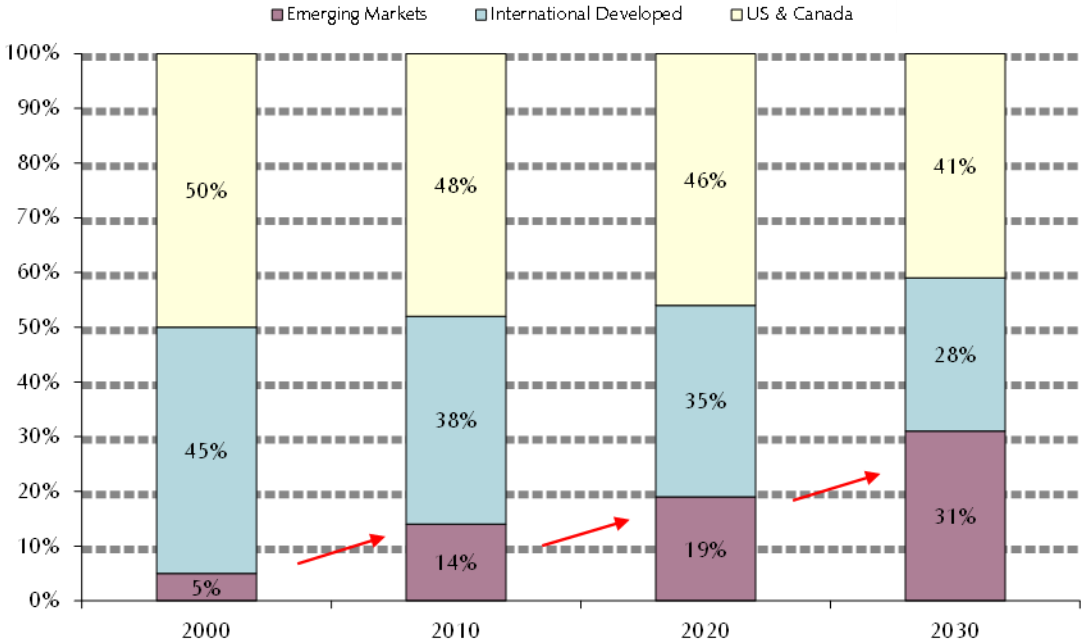
- One of the most powerful predictors of long-term equity returns has been the Cyclically Adjusted Price to Earnings Ratio (CAPE).
- This fundamentally driven measure is highly correlated with future returns, which are shown in the chart above using the CAPE metric on a reverse scale.

¹ Source: PE data are from Robert Shiller's website from 1927 - 1946; S&P and Bloomberg 1946 – present. S&P 500 equity returns are from Bloomberg for the entire period. Data is from December 31, 1927 to April 13, 2017.

International Emerging Market Equity

While international developed markets have come to represent a material portion of institutional public equity portfolios in recent years, many plans remain underexposed to the faster-growing emerging markets. Today, emerging markets comprise roughly 80% of the world’s population and close to 40% of global economic output.¹ Thus, even assuming no future growth, emerging markets equities should hold a place in any diversified public equity allocation.

Historical and Projected MSCI ACWI Index Weights

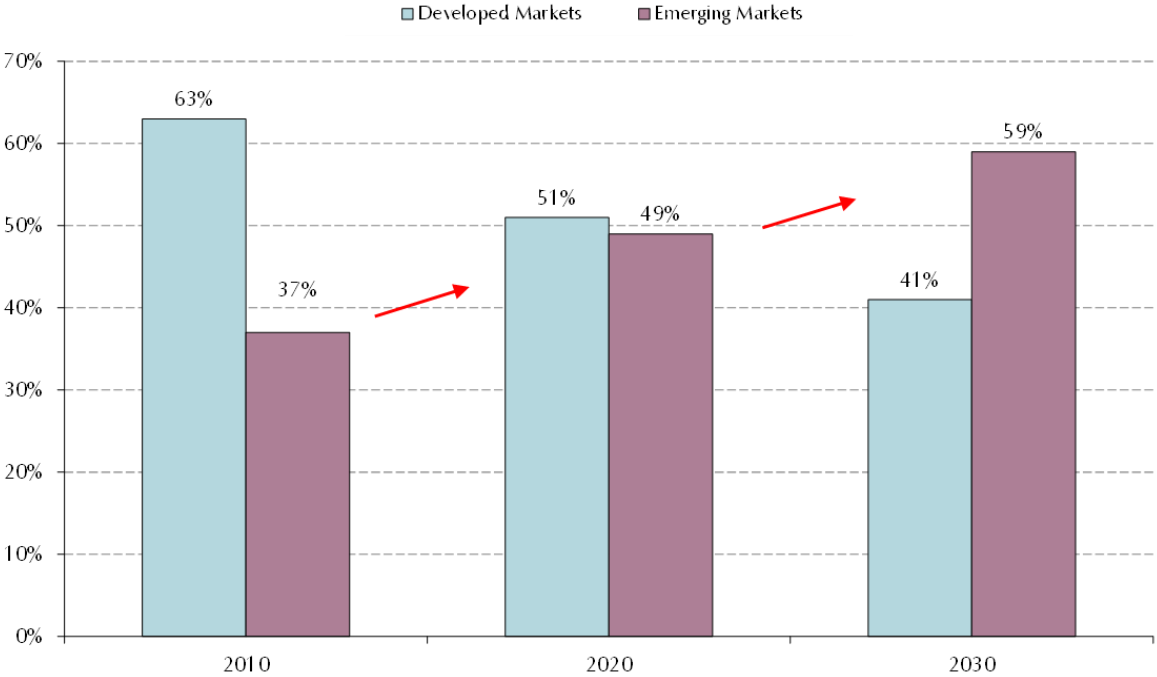


¹ Source: IFC, World Bank.

International Emerging Market Equity (continued)

The future growth argument for emerging market equities is strong. These countries start from a lower base of economic activity. Therefore, even modest improvements may result in large percentage increases. Emerging economies also benefit from increased globalization, favorable demographics, and lower debt levels compared to the developed world. Taken together, these factors make a strong case for higher future economic growth in emerging economies.

Projected Share of Global Growth¹



¹ Projections for 2020 and 2030 are from Goldman Sachs Global ECS Research.

International Emerging Market Equity (continued)

This added growth potential comes with increased volatility (risk). In addition, investing in emerging markets does introduce a heightened level of event risk (political, currency, etc.) to consider in assessing the risk/reward trade-off of investments in this asset class. However, while emerging markets have historically been more volatile than developed markets on a standalone basis, their relatively low correlation with developed markets can have a dampening effect on overall portfolio volatility. Additionally, emerging markets equities are valued at a significant discount to their long-term average.

International Emerging Market Equity (continued)

Emerging Market Equity Cyclically Adjusted P/E (as of December 31, 2016)

— Average — +1 Stdev — -1 Stdev - - - Implied — EM CAPE



Developing Investment Objectives

- What is the Fund's long term return objective?
 - Financial goals
 - Benefits stability and /or growth
 - Projected actuarial assumed rate of return of 8.0%
 - Funded status of 100%
 - Maintaining purchasing power
- What are the Fund's risk objectives?
 - Volatility (minimize, given financial goals)
 - Endpoint uncertainty
 - Year-to-year fluctuations in asset values and contribution levels
 - Risk of short-term loss (minimize, given financial goals)
 - Permanent capital impairment (minimize, given financial goals)
 - Failure to meet objectives
 - Probability of meeting your assumed rate of return (maximize, given other risk objectives)

Developing Investment Constraints

- What is the overall time horizon for the Fund?
 - On-going concern, but with long-term time horizon for majority of assets.
- What are the legal and regulatory constraints under which the Fund operates?
 - Commonwealth of Massachusetts laws.
 - PERAC Regulations.

Scenario Return Inputs

Asset Class	Benchmark Used
Investment Grade Bonds	Barclays Aggregate
TIPS	Barclays U.S. TIPS
Intermediate-term Government Bonds	Ibbotson U.S. Intermediate Government
Long-term Government Bonds	Barclays Long Term Treasury
EM Bonds	JPM GBI-EM Global Diversified
Bank Loans	CSFB Leveraged Loan
High Yield Bonds	Barclays High Yield
Core Real Estate	NCREIF Property
Value-Added RE	NCREIF Townsend Value Added
Opportunistic RE	NCREIF Townsend Opportunistic
REITs	NAREIT Equity
Infrastructure (private)	S&P Global Infrastructure
Natural Resources (private)	S&P Global Natural Resources
Timber	NCREIF Timberland
Commodities	Summer Haven Commodity
U.S. Equity	Russell 3000
Public Foreign Equity (Developed)	MSCI EAFE
Public Foreign Equity (Emerging)	MSCI Emerging Markets
Private Equity	Venture Economics Private Equity Composite
Long-short Equity	HFRI Equity Hedge
Global Macro	HFRI Macro
Hedge Funds	HFRI Fund of Funds Composite

Scenario Return Inputs

	GFC %	2008 %	Rate spike (1994) %	LTCM (July - Aug 1998) %	Crash of '87 (Sept - Nov 1987) %	Popping of the TMT Bubble (2q00 - 3q02) %	Strong dollar (1q81-3q82) %	Plummeting Dollar (Jan 1986 - Aug 87) %	Stagflation (1q80) %	Stagflation (1q73-3q74) %
Investment Grade Bonds	8.5	5.2	-2.9	1.8	2.2	28.6	16.1	8.4	-8.7	2.8
Short-term Bonds	7.9	5.0	0.5	1.6	2.3	21.9	29.9	13.2	-2.6	8.1
TIPS	8.2	-2.4	0.2	0.7	3.3	37.4	20.5	17.0	-2.7	14.6
Long-Term Government Bonds	24.2	24.0	-7.6	4.1	2.6	35.5	28.4	15.4	-13.6	-1.8
EM Bonds (local)	-7.9	-5.2	-10.3	-29.9	-9.1	6.3	-1.8	41.7	-7.3	-31.3
EM Bonds (major)	-5.0	-9.7	-18.9	-28.2	-9.1	6.3	2.6	22.9	-7.3	-31.3
Foreign Bonds	2.0	4.4	5.3	3.5	2.3	8.5	27.3	24.5	-2.8	8.1
Bank Loans	-23.7	-28.8	10.3	0.7	-3.6	6.3	7.1	14.3	-7.5	-19.9
High Yield Bonds	-22.8	-26.2	-1.0	-5.0	-3.6	-6.3	7.1	14.3	-7.5	-19.9
Core Real Estate	-23.9	-14.7	6.4	0.0	2.1	23.5	13.0	6.8	5.5	-16.1
Value-Added RE	-52.5	-19.4	7.5	0.0	1.6	28.1	15.6	8.2	6.6	-19.3
Opportunistic RE	-53.9	-36.4	9.4	0.0	1.7	31.3	17.2	9.0	7.3	-21.2
REITs	-63.0	-37.7	3.2	-15.3	-14.0	45.4	5.6	16.2	-4.4	-31.6
Infrastructure	-28.1	-23.4	-4.8	-2.0	-7.3	-3.1	17.2	23.2	-6.1	-24.5
Natural Resources	-22.9	-23.0	3.9	-11.5	-11.5	-10.0	-10.0	48.8	2.9	-13.1
Timberland	-1.2	5.6	15.4	0.0	11.9	-1.5	1.3	24.3	3.4	-1.6
Farmland	26.7	16.0	9.4	0.0	11.9	11.4	1.3	24.3	3.4	-1.6
Commodities	-32.6	-33.7	11.6	-10.1	5.6	2.0	-24.4	7.3	-10.4	132.3
U.S. Equity	-45.9	-37.3	0.2	-16.9	-29.8	-43.1	-1.9	31.5	-6.3	-42.6
Public EAFE Equity	-52.1	-43.4	7.8	-11.5	-14.5	-46.7	-10.7	69.1	-7.0	-42.6
Public EM Equity	-51.2	-53.3	7.8	-26.7	-14.5	-43.9	-10.7	69.1	-7.0	-42.6
Long-Short Equity	-26.4	-26.6	2.6	-8.3	-17.9	-8.8	-1.2	18.9	-3.8	-25.6
Private Equity	-22.1	-19.9	14.6	0.0	2.7	-15.1	-1.4	15.0	-4.4	-29.8
Global Macro/GTAA	7.4	4.8	-4.3	-3.5	-5.4	12.8	9.8	20.9	-4.8	11.1
Hedge Funds (FoF)	-19.5	-21.4	-3.5	-7.7	-16.8	-0.4	-0.3	18.3	-5.4	-23.2
Hedge Funds	-17.8	-19.0	4.1	-9.4	-15.8	-2.1	0.7	19.3	-4.4	-22.2
Cash	2.6	1.6	3.9	0.8	1.4	4.7	13.3	5.9	2.9	13.5
Gold (spot)	23.6	5.8	-1.9	-7.2	8.6	15.9	-32.7	38.7	-3.4	137.5

Stress Test Return Assumptions¹

	Rates Rise 100 bp %	Rates Rise 200 bp %	Rates Rise 300 bp %	BBB Spreads widen by 50 bp %	BBB Spreads widen by 300 bp %	USD Gains 10% %	USD Gains 20% %	Equities Decline 10% %	Equities Decline 25% %	Equities Decline 40% %	Rates Fall 100 bp %	Rates Fall 200 bp %
Public Domestic Equity	10.3	9.0	6.9	6.0	-42.0	3.5	7.0	-10.0	-25.0	-40.0	10.5	8.4
Public Foreign Equity (Developed)	10.3	9.0	6.9	5.5	-33.0	-7.0	-14.0	-10.5	-26.3	-42.0	10.5	8.4
Public Foreign Equity (Emerging)	10.3	9.0	6.9	5.0	-39.0	-7.0	-14.0	-11.0	-27.5	-44.0	10.5	8.4
Long-Short Hedge Funds	6.4	7.0	6.0	6.5	-21.0	2.1	4.2	-6.0	-15.0	-24.0	6.3	5.0
Private Equity	5.2	4.5	3.5	6.0	-42.0	3.5	7.0	-8.0	-20.0	-32.0	5.3	4.2
Core Real Estate	8.7	9.6	8.7	9.5	-12.0	4.0	8.0	-5.0	-12.5	-20.0	5.5	5.2
REITs	7.9	8.0	6.0	0.5	-36.0	1.0	2.0	-9.5	-23.8	-38.0	14.9	7.4
Non-Core Real Estate	7.1	10.4	9.3	11.5	-24.0	4.0	8.0	-7.0	-17.5	-28.0	3.6	7.6
Infrastructure (private)	4.3	2.6	2.9	3.5	-24.0	3.0	6.0	-5.0	-12.5	-20.0	5.3	5.5
Natural Resources (private)	8.6	12.2	13.5	2.0	-16.5	-3.1	-6.2	-5.0	-12.5	-20.0	2.5	2.0
Natural Resources (public)	11.4	16.2	18.0	4.0	-33.0	-6.2	-12.3	-9.5	-23.8	-38.0	5.0	4.0
Commodities	8.7	4.6	-0.6	-0.5	-21.0	-15.0	-30.0	-7.0	-17.5	-28.0	1.8	-4.8
Short-Term Bonds	-6.4	-12.2	-17.9	8.0	6.0	7.0	14.0	1.0	2.5	4.0	5.1	10.9
Long-Term Government Bonds	-15.3	-33.6	-52.0	12.0	15.0	10.0	20.0	5.0	12.5	20.0	21.6	40.0
TIPS	-7.0	-15.8	-24.6	8.5	12.0	8.0	16.0	1.0	2.5	4.0	10.6	19.4
Investment Grade Bonds	-3.4	-8.6	-13.9	-0.4	-4.6	8.0	16.0	2.0	5.0	8.0	7.2	12.5
Investment Grade Corporate Bonds	-4.3	-11.4	-18.5	-1.4	-18.5	8.0	16.0	-1.5	-3.8	-6.0	9.9	17.0
Foreign Developed Bonds	-5.1	-11.8	-18.5	0.0	-3.5	-6.3	-12.6	-2.0	-5.0	-8.0	8.4	15.2
Emerging Market Bonds (external)	-2.0	-7.9	-13.9	-2.7	-25.9	5.0	10.0	-2.0	-5.0	-8.0	10.0	16.0
Emerging Market Bonds (local)	-0.8	-6.6	-12.3	1.4	-8.0	-6.3	-12.6	-3.0	-7.5	-12.0	10.7	16.4
High Yield Bonds	1.5	-2.6	-6.7	-4.9	-35.9	4.5	9.0	-6.0	-15.0	-24.0	9.7	13.8
Bank Loans	5.0	6.0	7.5	2.5	-30.0	4.5	9.0	-6.0	-15.0	-24.0	3.0	2.0
Hedge Funds	5.8	6.2	3.6	3.5	-18.0	5.0	10.0	-5.0	-12.5	-20.0	8.1	4.4
TAA	7.8	5.7	3.1	6.5	-22.2	3.2	6.4	-7.0	-17.5	-28.0	10.8	11.8
Risk Parity	6.1	2.1	-2.5	5.6	-12.0	1.6	3.3	-2.0	-5.0	-8.0	10.2	12.3

¹ Assumptions are based on performance for each asset class during historical periods that resembled these situations.

Overview of Annual Asset Study Methodology

- In order to construct an optimal portfolio from a risk-return standpoint, conventional financial wisdom dictates that one develop return, volatility, and correlation expectations over the relevant investing horizon.
- Given the uncertainty surrounding financial and economic forecasts, expectations development is challenging, and any of several methodological approaches may meaningfully contribute to this complex task.
- Meketa Investment Group's process relies on both quantitative and qualitative methodologies.
- First, we employ a large set of quantitative models to arrive at a set of baseline expected ten-year annualized returns for major asset classes.
- These models attempt to forecast a gross "beta" return for each *public market* asset class; that is, we specifically do not model "alpha," nor do we apply an estimate for management fees or other operational expenses¹.
- Our models are fundamentally based (based on some theoretically defined return relationship with current observable factors).
- Some of these models are more predictive than others. For this reason, we next overlay a qualitative analysis, which takes the form of a data-driven deliberation among the research team and our Investment Policy Committee.
- Return assumptions for hard-to-predict asset classes as well as those with limited data will be influenced more heavily by our qualitative analysis.
- As a result of this process, we form our ten-year annualized return expectations, which serve as the primary foundation of our longer-term, twenty-year expectations.

¹ Our expectations are net of fees where passive management is not available (e.g., private markets and hedge funds).

Overview of Annual Asset Study Methodology (continued)

- We form our twenty-year annualized return expectations by systematically considering historical returns on an asset class by asset class level. Specifically, we construct a weighted average of our ten-year expectations and average historical returns in each asset class.
- The weights are determined by a qualitative assessment of the value of the historical data. Generally, if we have little confidence that the historical average return is representative of what an investor can expect¹, we will weight our ten-year forecast more heavily. Therefore, the weight on our ten-year forecasts ranges from 0.5 to 0.9.
- We develop our twenty-year volatility and correlation expectations differently. We rely primarily on historical averages, with an emphasis given to the experience of the trailing ten years.
- Qualitative adjustments, when applied, usually serve to increase the correlations and volatility over and above the historical estimates (e.g., using the higher correlations usually observed during a volatile market).
- We also make adjustments to the volatility based on the historical skewness of each asset class (e.g., increasing the volatility for an asset class that has been negatively skewed).
- In the case of private markets and other illiquid asset classes where historical volatility and correlations have been artificially dampened, we seek public market equivalents on which to base our estimates before applying any qualitative adjustments.
- These volatility and correlation expectations are then combined with our twenty-year return expectations to assist us in subsequent asset allocation work, including mean-variance optimization and scenario analyses.

¹ For example, we have less confidence in historical data that do not capture many possible market scenarios or that are overly polluted by survivorship bias.

**Meketa Investment Group 2017 Annual Asset Study
Twenty-Year Annualized Return and Volatility Expectations for Major Asset Classes**

Asset Class	Expected Return (%)	Volatility (%)
Fixed Income		
Cash Equivalents	2.8	1.0
Short-term Investment Grade Bonds	3.0	2.0
Investment Grade Bonds	3.5	4.0
Investment Grade Corporate Bonds	4.2	7.0
Long-term Government Bonds	3.8	12.5
Long-term STRIPS	4.0	20.0
TIPS	3.5	7.5
High Yield Bonds	6.0	12.5
Bank Loans	5.5	10.0
Foreign Bonds	2.4	9.0
Emerging Market Bonds (major)	5.5	12.0
Emerging Market Bonds (local)	5.9	14.5
Equities		
US Equity	7.5	18.0
Developed Market Equity	7.3	20.0
Emerging Market Equity	9.8	26.0
Frontier Market Equity	9.5	24.0
Global Equity	7.9	19.0
Private Equity/Debt	9.2	24.0
Buyouts	9.6	25.0
Venture Capital	9.5	35.0
Real Assets		
Real Estate	6.9	18.0
REITs	6.5	29.0
Core Private Real Estate	5.7	12.5
Value Added Real Estate	7.2	19.0
Opportunistic Real Estate	8.9	25.0
Natural Resources (Public)	7.0	24.0
Natural Resources (Private)	8.4	23.0
Commodities (naïve)	4.5	19.5
Infrastructure (Public)	7.4	19.0
Core Infrastructure (Private)	6.8	16.0
Non-Core Infrastructure (Private)	8.8	23.0

Meketa Investment Group 2017 Annual Asset Study: Correlation Expectations

	TIPS	Investment Grade Bonds	High Yield Bonds	U.S. Equity	Developed Market Equity	Emerging Market Equity	Private Equity	Real Estate	Natural Resources (private)	Commodities	Core Infrastructure (private)	Hedge Funds
TIPS	1.00											
Investment Grade Bonds	0.80	1.00										
High Yield Bonds	0.30	0.20	1.00									
U.S. Equity	0.00	0.05	0.70	1.00								
Developed Market Equity	0.15	0.05	0.70	0.90	1.00							
Emerging Market Equity	0.15	0.05	0.70	0.80	0.90	1.00						
Private Equity/Debt	0.05	0.05	0.65	0.85	0.80	0.75	1.00					
Real Estate	0.10	0.20	0.50	0.50	0.45	0.40	0.45	1.00				
Natural Resources (private)	0.10	0.10	0.45	0.65	0.60	0.60	0.55	0.45	1.00			
Commodities	0.35	0.05	0.40	0.35	0.55	0.60	0.30	0.15	0.65	1.00		
Core Infrastructure (private)	0.30	0.30	0.60	0.55	0.55	0.50	0.45	0.60	0.60	0.35	1.00	
Hedge Funds	0.20	0.05	0.70	0.80	0.85	0.85	0.65	0.45	0.65	0.65	0.60	1.00

Disclaimer, Glossary, and Notes

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In general, the valuation numbers presented in this report are prepared by the custodian bank for listed securities, and by the fund manager or appropriate General Partner in the case of unlisted securities. The data used in the market comparison sections of this report are sourced from various databases. These data are continuously updated and are subject to change.

This report does not contain all the information necessary to fully evaluate the potential risks of any of the investments described herein. Because of inherent uncertainties involved in the valuations of investments that are not publicly traded, any estimated fair values shown in this report may differ significantly from the values that would have been used had a ready market for the underlying securities existed, and the differences could be material. Note that for unlisted securities the valuations may be lagged by one or more calendar quarters, or may reflect original cost.

This document may contain certain forward-looking statements, forecasts, estimates, projections, and opinions (“Forward Statements”). No representation is made or will be made that any Forward Statements will be achieved or will prove to be correct. A number of factors, in addition to any risk factors stated in this material, could cause actual future results to vary materially from the Forward Statements. No representation is given that the assumptions disclosed in this document upon which Forward Statements may be based are reasonable. There can be no assurance that the investment strategy or objective of any fund or investment will be achieved, or that the Fund will receive a return of the amount invested.

In some cases, Meketa Investment Group assists the Trustees in handling capital calls or asset transfers among investment managers. In these cases, we do not make any representations as to the managers’ use of the funds, but do confirm that the capital called or transferred is within the amounts authorized by the Trustees.

Credit Risk: Refers to the risk that the issuer of a fixed income security may default (i.e., the issuer will be unable to make timely principal and/or interest payments on the security.)

Duration: Measure of the sensitivity of the price of a bond to a change in its yield to maturity. Duration summarizes, in a single number, the characteristics that cause bond prices to change in response to a change in interest rates. For example, the price of a bond with a duration of three years will rise by approximately 3% for each 1% decrease in its yield to maturity. Conversely, the price will decrease 3% for each 1% increase in the bond's yield. Price changes for two different bonds can be compared using duration. A bond with a duration of six years will exhibit twice the percentage price change of a bond with a three-year duration. The actual calculation of a bond's duration is somewhat complicated, but the idea behind the calculation is straightforward. The first step is to measure the time interval until receipt for each cash flow (coupon and principal payments) from a bond. The second step is to compute a weighted average of these time intervals. Each time interval is measured by the present value of that cash flow. This weighted average is the duration of the bond measured in years.

Information Ratio: This statistic is a measure of the consistency of a portfolio's performance relative to a benchmark. It is calculated by subtracting the benchmark return from the portfolio return (excess return), and dividing the resulting excess return by the standard deviation (volatility) of this excess return. A positive information ratio indicates outperformance versus the benchmark, and the higher the information ratio, the more consistent the outperformance.

Jensen's Alpha: A measure of the average return of a portfolio or investment in excess of what is predicted by its beta or "market" risk. Portfolio Return- [Risk Free Rate+Beta*(market return-Risk Free Rate)].

Market Capitalization: For a firm, market capitalization is the total market value of outstanding common stock. For a portfolio, market capitalization is the sum of the capitalization of each company weighted by the ratio of holdings in that company to total portfolio holdings; thus it is a weighted-average capitalization. Meketa Investment Group considers the largest 65% of the broad domestic equity market as large capitalization, the next 25% of the market as medium capitalization, and the smallest 10% of stocks as small capitalization.

Market Weighted: Stocks in many indices are weighted based on the total market capitalization of the issue. Thus, the individual returns of higher market-capitalization issues will more heavily influence an index's return than the returns of the smaller market-capitalization issues in the index.

Maturity: The date on which a loan, bond, mortgage, or other debt/security becomes due and is to be paid off.

Prepayment Risk: The risk that prepayments will increase (homeowners will prepay all or part of their mortgage) when mortgage interest rates decline; hence, investors' monies will be returned to them in a lower interest rate environment. Also, the risk that prepayments will slow down when mortgage interest rates rise; hence, investors will not have as much money as previously anticipated in a higher interest rate environment. A prepayment is any payment in excess of the scheduled mortgage payment.

Price-Book Value (P/B) Ratio: The current market price of a stock divided by its book value per share. Meketa Investment Group calculates P/B as the current price divided by Compustat's quarterly common equity. Common equity includes common stock, capital surplus, retained earnings, and treasury stock adjusted for both common and nonredeemable preferred stock. Similar to high P/E stocks, stocks with high P/B's tend to be riskier investments.

Price-Earnings (P/E) Ratio: A stock's market price divided by its current or estimated future earnings. Lower P/E ratios often characterize stocks in low growth or mature industries, stocks in groups that have fallen out of favor, or stocks of established blue chip companies with long records of stable earnings and regular dividends. Sometimes a company that has good fundamentals may be viewed unfavorably by the market if it is an industry that is temporarily out of favor. Or a business may have experienced financial problems causing investors to be skeptical about its future. Either of these situations would result in lower relative P/E ratios. Some stocks exhibit above-average sales and earnings growth or expectations for above average growth. Consequently, investors are willing to pay more for these companies' earnings, which results in elevated P/E ratios. In other words, investors will pay more for shares of companies whose profits, in their opinion, are expected to increase faster than average. Because future events are in no way assured, high P/E stocks tend to be riskier and more volatile investments. Meketa Investment Group calculates P/E as the current price divided by the I/B/E/S consensus of twelve-month forecast earnings per share.

Quality Rating: The rank assigned a security by such rating services as Fitch, Moody's, and Standard & Poor's. The rating may be determined by such factors as (1) the likelihood of fulfillment of dividend, income, and principal payment of obligations; (2) the nature and provisions of the issue; and (3) the security's relative position in the event of liquidation of the company. Bonds assigned the top four grades (AAA, AA, A, BBB) are considered investment grade because they are eligible bank investments as determined by the controller of the currency.

Sharpe Ratio: A commonly used measure of risk-adjusted return. It is calculated by subtracting the risk free return (usually three-month Treasury bill) from the portfolio return and dividing the resulting excess return by the portfolio's total risk level (standard deviation). The result is a measure of return per unit of total risk taken. The higher the Sharpe ratio, the better the fund's historical risk adjusted performance.

Standard Deviation: A measure of the total risk of an asset or a portfolio. Standard deviation measures the dispersion of a set of numbers around a central point (e.g., the average return). If the standard deviation is small, the distribution is concentrated within a narrow range of values. For a normal distribution, about two thirds of the observations will fall within one standard deviation of the mean, and 95% of the observations will fall within two standard deviations of the mean.

STIF Account: Short-term investment fund at a custodian bank that invests in cash-equivalent instruments. It is generally used to safely invest the excess cash held by portfolio managers.

Style: The description of the type of approach and strategy utilized by an investment manager to manage funds. For example, the style for equities is determined by portfolio characteristics such as price-to-book value, price-to-earnings ratio, and dividend yield. Equity styles include growth, value, and core.

Yield to Maturity: The yield, or return, provided by a bond to its maturity date; determined by a mathematical process, usually requiring the use of a “basis book.” For example, a 5% bond pays \$5 a year interest on each \$100 par value. To figure its current yield, divide \$5 by \$95—the market price of the bond—and you get 5.26%. Assume that the same bond is due to mature in five years. On the maturity date, the issuer is pledged to pay \$100 for the bond that can be bought now for \$95. In other words, the bond is selling at a discount of 5% below par value. To figure yield to maturity, a simple and approximate method is to divide 5% by the five years to maturity, which equals 1% pro rata yearly. Add that 1% to the 5.26% current yield, and the yield to maturity is roughly 6.26%.

$$\frac{5\% \text{ (discount)}}{5 \text{ (yrs. to maturity)}} = 1\% \text{ pro rata, plus } 5.26\% \text{ (current yield)} = 6.26\% \text{ (yield to maturity)}$$

Sources: [Investment Terminology](#), International Foundation of Employee Benefit Plans, 1999.
[The Handbook of Fixed Income Securities](#), Fabozzi, Frank J., 1991.

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Throughout this report, numbers may not sum due to rounding.

Returns for periods greater than one year are annualized throughout this report.

Values shown are in millions of dollars, unless noted otherwise.