MEKETA INVESTMENT GROUP

2017 ASSET STUDY UPDATE

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Each year, we revise our capital market expectations via our Asset Study

This involves setting long-term expectations for a variety of asset classes for:

- Returns

- Standard Deviation

- Correlations

Our process relies on both quantitative and qualitative methodologies.

This document represents a selection of information and results from our 2017 Annual Asset Study.

Asset Class Definitions

- Meketa Investment Group utilizes an approach that identifies asset classes that are appropriate for long-term allocation of funds, and that also are investable.

- Three considerations influence this process: unique return behavior, an observable historical track record, and a robust market.

- We then forecast risk, return, and volatility statistics for each unique asset class.

Structural Changes for 2017

- Changed the GDP growth assumption calculation for Equities

    - Combining projections from IMF and Oxford Economics for years 1-5 with projections from Oxford Economics for years 6-10 for U.S., EAFE, EM and Frontier economies.

    - Before, we were using IMF projections for years 1-5 and combining them with historical averages to arrive at 10 year projections.

    - This change takes into account expectations of future lower growth relative to history around the globe (the Oxford number converge to potential GDP).

The first step is to build our 10-year forecasts

Our fundamental models are primarily valuation-based.

- Each model falls in one of eight groups, based on the most important factors that drive their returns:

Asset Class Category	Major Factors
Equities	Dividend Yield, GDP Growth, Valuation
Bonds	Yield to Worst, Default Rate, Recovery Rate
Commodities	Collateral Yield, Roll Yield, Inflation
Infrastructure	Public IS Valuation, Income, Growth
Natural Resources	Price per Acre, Income, Public Market Valuation
Real Estate	Cap Rate, Yield, Growth
Private Equity	EBITDA Multiple, Debt Multiple, Public VC Valuation
Hedge Funds and Other	Leverage, Alternative Betas, Trend Following Signals

The next step is to move from 10-year to our 20-year forecasts

We do this by combining our 10-year forecasts with the historical returns for each asset class

- How much we apply to each depends on our confidence in them (both the model & the data)

  - The 10-year model weighting varies between 50% and 100%

  - It only hits 100% when there is a lack of good historical data

We then infer a forecast of 10-year returns in ten years (i.e., years 11-20)

- This allows us to test our assumptions with finance theory

- Essentially, we assume mean-reversion over the first ten years, then consistency with CAPM thereafter

The final step is to make any adjustments

The Investment Committee reviews the output and may make adjustments based due to:

- Quality of the underlying data

- Confidence in the model

- External inputs (e.g., perceived risks)

Capital Market Assumption Development Example: Equities

- We use a fundamental model for equities that combine income and capital appreciation

$$E(R) = Dividend\ Yield + Price\ Return + Currency\ Effect$$

$$Price\ Return = Earnings\ Growth + Multiple\ Effect$$

- We use the current dividend yield on the respective index[1]

- We use two approaches to calculate the multiple effect, and then average them

  – For Model 1, the growth rate is objective and the multiple effect is based on future PE10

$$Multiplier\ Effect_{Model\ 1} = -2.2\%$$

  – For Model 2, the growth rate is subjective and the multiple effect is based on future PE

$$Multiplier\ Effect_{Model\ 2} = -2.6\%$$

- The models assume reversion to the mean

  – We are inherently assuming that there is some fair valuation that investors are willing to pay for a stream of future earnings (think DDM)

- We arrive at our final assumption (in local currency) by equal-weighting model 1 and model 2

$$US\ E(R) = 2.1\% + [(1 + 4.8\%)*(1 - 2.4\%) - 1] = 4.3\%$$

- For non-US equities, we add the expected currency effect vs. the US Dollar to the local expected return

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[1] The source for dividend yields is S&P 500 for the US and MSCI for non-US equities.

Capital Market Assumption Development Example: Bonds

- The short version for investment grade bond models is:

    E(R)=Current YTW (yield to worst)

- Our models assume that there is a reversion to the mean for spreads (though not yields).

- For TIPS, we add the real yield of the TIPS index to the breakeven inflation rate.

- As with equities, we make currency adjustments when necessary for foreign bonds.

- For bonds with credit risk, Meketa Investment Group estimates default rates and loss rates , in order to project an expected return:

    *E(R)= YTW - (Annual Default Rate * Loss Rate)*

Don't forget about the other inputs: standard deviation and correlation

Standard deviation:

- We reviewed the trailing ten-year standard deviation, as well as the trailing ten-year skewness

- Historical standard deviation served as the base for our assumptions

- We increased or decreased the assumptions based on the size and sign of the historical skewness

Asset Class	Standard Deviation	Skewness	Assumption
Bank Loans	8.0%	-1.9	10.0%

- We looked at performance during the GFC to see if further changes were warranted (e.g., hedge funds)

- We also adjusted for private market asset classes with "smoothed" return streams

Correlation:

- We used trailing ten-year correlations as our guide

- Again, we made adjustments for performance during the GFC and "smoothed" return streams

Most of our adjustments are conservative in nature (i.e., they increase the standard deviation and correlation)

Fixed Income:

	2017 E(R) (%)	2016 E(R) (%)	Δ from 2016 (%)	Notes
Cash Equivalents	2.8	2.3	0.5	Higher yield and Inflation expectations
Investment Grade Bonds	3.5	3.6	-0.1	Higher rates offset by tighter spreads
Long-term Government Bonds	3.8	3.6	0.2	Higher yield
TIPS	3.5	3.3	0.2	Higher inflation expectations
High Yield Bonds	6.0	6.8	-0.8	Rapid spread tightening in '16 following oil crisis
Bank Loans	5.5	5.7	-0.2	Lower spreads
Emerging Market Bonds (major)	5.5	5.9	-0.4	Lower yield
Emerging Market Bonds (local)	5.9	6.3	-0.4	Lower yield
Long-Short Credit	4.7	4.8	-0.1	Impact of tighter credit spreads

Equities:

	2017 E(R) (%)	2016 E(R) (%)	Δ from 2016 (%)	Notes
US Equity	7.5	7.8	-0.3	Higher prices and lower growth expectations
Dev. Market Equity (non-US)	7.3	8.1	-0.8	Lower growth expectations
Developed Market Small Cap	6.5	7.0	-0.5	See above
Emerging Market Equity	9.8	10.5	-0.7	Higher prices and lower growth expectations
Emerging Market Small Cap	9.3	9.8	-0.5	See above
Frontier Market Equity	9.5	9.5	0.0	
Global Equity	7.9	8.2	-0.3	Higher prices and lower growth expectations
Long-Short Equity	4.6	4.7	-0.1	Lower equity offset by higher cash expectations
Private Equity Composite	9.6	9.7	-0.1	
Buyouts	9.6	9.8	-0.2	Higher EBITDA and Debt multiples
Venture Capital	9.5	9.5	0.0	
Private Debt Composite	6.9	7.3	-0.4	
Mezzanine Debt	6.8	6.9	-0.1	Lower coupons
Distressed Debt	6.9	7.7	-0.8	Lower yields
Private Equity Fund of Funds	7.8	8.1	-0.3	

Real Assets:

	2017 E(R) (%)	2016 E(R) (%)	Δ from 2016 (%)	Notes
Real Estate	6.9	7.1	-0.2	
Core Private Real Estate	5.7	5.9	-0.2	Lower cap rates
Value-Added Real Estate	7.2	7.5	-0.3	See above
Opportunistic Real Estate	8.9	9.2	-0.3	See above
Natural Resources (Public)	7.0	7.8	-0.8	Higher prices after '16 recovery
Natural Resources (Private)	8.4	8.4	0.0	
Timberland	6.5	6.8	-0.3	Higher prices
Farmland	7.3	7.6	-0.3	Higher prices
Oil & Gas E&P	9.1	8.9	0.2	Higher earnings expectations
Mining	8.5	8.8	-0.3	Lower earnings expectations
Commodities	4.5	4.1	0.4	Higher inflation and cash expectations
Commodities: risk parity	5.4	5.0	0.4	See above
Commodities: Real Return	4.7	4.6	0.1	See above
Infrastructure (Public)	7.4	7.8	-0.4	Higher prices
Infrastructure (Core Private)	6.8	6.7	0.1	
Infrastructure (Non-Core Private)	8.	9.1	-0.3	Higher prices

Alternative Strategies (Other):

	2017 E(R) (%)	2016 E(R) (%)	Δ from 2016 (%)	Notes
Hedge Funds	5.3	5.6	-0.3	
Global Macro	5.5	5.8	-0.3	Lower equity & yields, partially offset by higher commodity expectations
Relative Value	5.8	6.2	-0.4	See above
Tactical Asset Allocation	4.7	5.0	-0.3	
US Inflation	2.6%	2.5	0.1	

Comparison of Total Portfolio Expectations

	Federated Pension Current Policy	P&F Pension Current Policy	Federated Healthcare Current Policy	P&F Healthcare Current Policy	60/40
Equity Assets	37%	31%	47	43	60%
Global Equity	28	23	47	43	60
Private Equity	9	8	0	0	0
Fixed Income Assets	24	27	30	15	40
Investment Grade Bonds	5	6			
Inflation Linked Bonds	5	0			
Global Credit	14	21			
Long-Short Credit	4	0			
Private Debt	5	11			
High Yield/Bank Loans	0	5			
Emerging Markets Debt	5	5			
Real Assets/Inflation-Linked	23	17	23	22	0
Real Estate	7	7			
Natural Resources	5	0			
Infrastructure	5	0			
Commodities	6	7			
Multi-Asset Inflation-Linked	0	3			
Absolute Return Assets	11	6	0	0	0
GTAA/Opportunistic	5	10	0	20	0
Expected Return 2017	7.1	7.5	6.7	6.9	6.7
Expected Return 2016	7.3	7.6	6.9	7.1	6.9
Standard Deviation 2017	11.6	13.8	11.8	13.5	11.6
Standard Deviation 2016	11.9	13.8	12.1	13.8	11.9

[1] Expected return, standard deviation and correlation data based on Meketa Investment Group's 2017 and 2016 Annual Asset Studies.

An overview of the results: