

MODELING ALM RETURNS AND VOLATILITIES IN A "NEW" ENVIRONMENT

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CONTENT

- Reasons for possible change in ALM modeling
- Responses
- Standard approaches
- Adjustments to standard approaches
- Adjustments to asset allocation strategy
- Conclusions



REASONS FOR POSSIBLE CHANGE

- Experiences in 2008
 - Frequency of draw downs (last severe drawdown in 2001)
 - Depth of draw down (>3 sigma event)
 - Limited help from diversification (strongly increasing correlations)
 - Liquidity becoming a bottle neck
 - Severe losses in short term, without possibility to act timely (asset managers, stakeholders)
- Lower expected returns
 - Short to medium term (deleveraging)
 - Long term /structural
 - Demographic developments (aging)
 - Lower productivity growth ? (Robert J. Gordon, Is US Economic Growth over ?)
 - Structural lower leverage
- Unprecedented economic environment
 - Unparalleled levels of global debt and money printing (4 years of QE)
 - Many financial indicators at multi-century highs/lows, e.g. interest rates

RESPONSES TO LESSONS LEARNT FROM FINANCIAL CRISIS

	Market practice before	Responses
Capital Market Modeling	 Normally distributed returns and constant parameters No consideration of clustered high volatilities No credit risk for sovereign debt 	 Lower expected returns Regime switching approach Credit risk models for sovereign debt
Portfolio construction	• Use of traditional ALM Model	 Robust portfolio optimization Take tail risks into account Explicit stress testing
Asset Allocation	Static SAA	 Dynamic asset allocation
	 On basis of asset classes 	 Additional elements Risk premia/factor returns Risk budgeting
	• Market Cap (FI)	 Customized benchmarks (e.g. excluding peripherals)

STANDARD APPROACHES FOR ALM INPUT

- 1. Historical Performance ("We have but one sample of history")
 - Assumption of remaining long-term behavior and asset class interdependencies
 - Equity risk, credit and maturity premium
 - Styles (e.g. value, carry, size and momentum)
 - Return versus Volatility
- 2. Theories/financial market models (macro-economic, financial, behavioral)
 - Macro economic
 - CAPM (efficient markets, constant expected returns)
 - Multiple factors
 - Rational risk and liquidity premia and irrational/psychological biases
 - Time variance of expected return and volatility
- 3. Forward looking indicators/current price
 - Better than historical averages, esp. when expected returns move over time
 - Return: bond yields for a given period
 - Inflation: break even inflation rate
 - Risk: Implied volatility in option markets
 - In the market matching estimators for future earnings and risk: valuation ratios

FIXED INCOME

• Lower share of highly rated bonds (from 68% pre-crisis to 52% today) implies fewer risk free assets.

• Central banks are buying government bonds, thus crowding out investors

• New issuance of fixed income spread products has declined (mortgages as well as corporates)

- Long term risks to global growth
 - European debt challenges
 - US fiscal challenges
 - Demographic developments (aging)



1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

Source: Deutsche Bank (2012) on basis of FRB, Haver Analytics, DB Global Markets Research

• More demand for risk-free assets and less supply of risk free assets, combined with significant long-term risks to global growth \Rightarrow interest rates for high quality government bonds likely to stay low for many more years

MODELING FIXED INCOME MARKETS (I)

- Financial instruments issued by sovereigns can be subject to credit risk
- Due to debt crisis sovereign bonds are not any more risk free
- Markets may, moreover, be distorted due to safe haven effects



MODELING OF FIXED INCOME MARKETS (2)

- Current yield curve as departing point
- Forward rate curve versus normative long run assumptions
- What is a reasonable long-run rate ? UFR value of 4.2% may be high
- Modeling credit risk by calibrating with CDS prices and historical spread data, using e.g. Cox-Ingersoll-Ross approach
- PS: Consistency of FI return and UFR discount rate in case of ALM pensions in FTK



EQUITY RETURNS

- Two main approaches
 - Bottom up Dividend Discount Model
 - Dividend yield +
 - Real earnings growth +
 - Inflation +
 - Adjustment for valuation at start
 - Risk free return plus (historically based) equity risk premium

• Results of equity risk premium approaches may be somewhat distorted by issues with respect to risk free rate (e.g. due to "flight to quality" effects)

• There seems to be as yet no clear consensus on the level of returns (next slides)

CONVERGENCE IN EXPECTED RETURNS ?

• Indicative return estimates of a number of providers

	GS (9/11)	Robeco (1/12)	JPM (12/11)	Mercer (7/12)	Aon Hewitt (12/11)	Morgan Stanley (ALM team) (2/12)	PGGM Survey (4/12)	DNB max.
Euro equity	6.7		8.25	7.6	8.0			7
NA/US equity	6.4		8.25		7.9			7
EM equity	7.6	8.5	10.25	9.5	10.1			7
Developed Markets		8	8	7.9		5.5	7	7
Cash/money markets		3.5	2.25					
Euro government AAA				2.1			3.4	4.5
Euro governm. Broad	3.1	4.25	3.5	3.5	2.1			4.5
IG corporate bonds		5	4.5	3.6	2.9	3.9		4.5
Global high yield	4.9	6	7.75	5.1		4.5	6.4	4.5
Emerg. Markets Debt	4.6	5.25	6.25	5.4		4.3	5.6	4.5
Euro private real estate	5.7	7	6.5	5.3		5.8	6.4	7.5
Private equity	9.2	8	9		9.8	5.5	8.1	7.5
Hedge Funds	6.4	4.8	6.5	5.0	5.9	4.5	5.7	7.5
Commodities	5.5	4.3	6.75	4.4	7.7		5.1	7.5

Notes: Differences in values may be partly due to the different start dates and definition issues

CONVERGENCE OF LONG-TERM RETURN FORECASTS ?

Long term forecasts 26 respondents end of 2011 (pension funds, sovereign wealth funds, ass et managers and investment banks; ca. 50% Dutch and 50% pension



•"Not everybody is convinced we tace a paradigm shift at the moment. Most participants that see such a shift, refer to the deleveraging process that is taking place".

Source: Results PGGM Survey 2012 - Long term economic and return forecasts

RISK-RETURN CHARACTERISTICS OF ASSET CLASSES

- Relative higher returns of illiquid asset classes due to liquidity premium
- DNB maximum does allow for this, e.g. in case of private equity



EQUITY RETURNS EMERGING MARKETS

- Relationship between higher economic growth and higher returns quite appealing
- However, many reasons (including economic exposure of corporates), why this does not necessarily need to hold (c.f. Dimson et al., 2010)



	Return	Vol.	Corr.
1990-2012			
Dev. Markets	3.3%	15.6%	0.64
Em. Markets	6.7%	19.1%	
2007-2012			
Dev. Markets	-4.1%	22.0%	0.76
Em. markets	0.0%	26.3%	

TIME VARYING VOLATILITY: REGIME SWITCHING

• (log) Normally distributed returns and constant parameters (no consideration of clustered high volatilities) ⇒ Regime/Markov Switching approach



NEW MODELING EQUITY MARKETS (2)

- "Normal" market: returns lie within the usual range
- Crisis market: expected return strongly below normal expected return and volatility increases significantly
- Complete model is a combination of estimated normal distributions, but shows overall no normal distribution
- Scenarios like 2008 are covered with higher probability compared to the normal distribution

Asset Class	Historical (worst annual since 1999)	Normal Distribution (1 st percentile)	Modeled distribution (1 st percentile)
Global Equity	-39	-33	-45
Emerging Market equity	-54	-52	-59
Global High Yield Debt	-27	-16	-31
Emerging Market Debt	-8	-29	-41
Commodities	-40	-30	-53

Performance of a number of asset classes (%)

Source: Mercer, 2012

STRUCTURAL CHANGE IN LEVEL OF VOLATILITY ?

- Some macro numbers suggest higher volatilities
- However, probably too early to tell
- In general, estimates of volatilities are more or less at pre-crises levels and seem to converge to some extent (next slide)



CONVERGENCE IN VOLATILITY ESTIMATES ?

• Indicative volatility estimates of a number of providers

	GS (9/11)	Robeco (1/12)	JPM (12/11)	Mercer (7/12)	Aon Hewitt (12/11)	Morgan Stanley (ALM team) (2/12)
Euro equity	20.9		21.25	20.3	23.4	
NA/US equity	17.7		18.75		21.7	
EM equity	24.6	25	26.5	25.0	31.8	15
Developed Markets		18	18	16.9		18
Cash/money markets		3	0.5			
Euro government AAA				4.7		
Euro governm. Broad	3.7	5	3.75	5.4	3.3*	
IG corporate bonds		6	4.5	3.6	4.2	5
Global high yield	11.8	12	19.5	10.5		11
Emerg. Markets Debt	12.7	10	11.0	9.0		
Euro private real estate	11.7	10	17.5	8.4		12
Private equity	24.1	25	28.25		29.6	22
Hedge Funds	7.1	10	7.25	6.9	7.8	11
Commodities	25.9	25	15.75	15.7	16.3	

Differences in values may be partly due to the different start dates and definition issues

TIME VARYING CORRELATION

- Recognition of inadequacy of (log) normal distribution due to fat tails
 - Time varying (normal) distribution, resulting in non-normal overall distribution
- Correlation e.g. depending on
 - Monetary/inflation uncertainty (~ level of inflation and short tem interest rate)
 - Changes in risk aversion (~ credit spread, dividend yield and equity return)



INFLATION (1)



- Scenario of moderate inflation (~ 2%) most likely
 - ECB target ceiling
 - In line with inflation implied by medium to long term break even inflation rate
 - Long term subdued economic environment (deleveraging), political resistance of important part of electorate, central bank independency
- Inflation scenario
 - Strong growth focus at cost of inflation
 - Central banks not successful in reversing loose monetary policy in case of growth pick up
- Deflation
 - Broad based austerity measures lead to deflationary spiral
 - Disorderly break up of Eurozone

INFLATION (2)

• Break even inflation good but not perfect proxy for expected inflation

• Risk premia will in general be positive, but may cancel out and vary over time, especially dependent on volatility/uncertainty in the markets

Composition of break even inflation rate



•Going forward, EUR inflation swaps less good NL inflation protection than in the past.

• Economic adjustment requires higher inflation in Northern as compared to Southern EU countries.

Cumulative inflation (%)



STRESS TESTING

- Pre-described deterministic scenarios
- Theoretically consistent scenarios (e.g. inflation, deflation, stagflation)
- Construction
 - Synthetic stress scenarios using a priori assumptions (partly historically based)
 - Historical scenarios (e.g. Japan scenario, crash 1987, financial crisis 2008, Euro crisis)
 - Multifactor model for asset returns
- Risk of missing the unexpected (Black Swan)
- Makes effects explicit, e.g. in case of effect of inflation hedging in various scenarios
- Specific attention to illiquidity issues in context of
 - Illiquid assets
 - Currency hedging overlay
 - Interest rate and inflation swap overlays

DYNAMIC STRATEGIC ASSET ALLOCATION

• Adherence to static Strategic asset Allocation denotes risk of severe losses of the portfolio in the short term ⇒ Dynamic Asset Allocation

- Model based approach
 - CPPI
 - Pro cyclical (disregards possible mean reversion)
 - Relatively benign results on basis of historical data (e.g. Mercer, AAI)
 - In line with regulatory oversight
 - On basis of valuation (extremes)
 - Implicitly assuming mean reversion
 - Difficult to proof
 - However, long-term expected returns tend to be especially high following adverse events (Ilmanen, 2011)
 - Higher equity returns after recessions
 - Nominal bonds higher return after inflation
- Discretionary on basis of valuations extremes
 - Implicitly assuming mean reversion
 - Contrarian decisions appear to be difficult in practice

RULE BASED RISK MANAGEMENT STRATEGY

• Allows the assessment of the combined effect of a liability oriented strategy portfolio together with dynamic risk management activities

• Dynamic positioning mechanisms employ the available risk budgets efficiently while preventing large losses in plan assets



HISTORICAL INVESTORS RESPONSES

Strategy	Underlying Belief	Investment Model
More Equities	Equity Premium	Traditional 60/40
More Illiquid Assets	Illiquidity Premium	Endoursent Medal
More Hedge Funds	Alpha/illiquidity	
Multiple Return Sources	Style diversification	Norway Model ?

Future/going forward

- Strongly diversify: harvest market rewards from multiple sources
 - Besides asset class premia, style/factor premia (values, size, (low) volatility etc.)
- Try to exploit time-variation in expected returns
 - Forward-looking valuations are good starting point but have pitfalls: short structural changes
- Seek to improve reliability of returns using portfolio construction, risk management and cost control

FOCUS ON RETURN AND RISK DRIVERS

- Simplification by grouping into asset classes
- Identify underlying factors driving portfolio returns: factor-based approach
- Alternatively/additionally/beyond asset classes, on basis of (distinguishable) return sources
 - Equity risk premium
 - Small Cap
 - Value/growth
 - Term structure
 - Credit
 - Unexpected inflation
 - Illiquidity
 - Tail risks (volatility, correlation, return asymmetries)
 - Alpha/other
- Qualitative
 - Leverage (beta adjustment)
 - Political/regulatory (fait tails)
 - Illiquidity (de-smoothing)

• Better diversify over asset classes ànd return sources as for diversifying across economic scenarios

ATTRIBUTION OF RETURN SOURCES

- Characterize asset classes on basis of combination of return driving factors
- Approach feasible in practice ? (again very dependent on historical data/period)
- However, in any case very useful additional dimension complementing other methods



Attribution of Expected Return of Selected Asset Classes

Source: Mercer, 2012

ATTRIBUTION OF PREMIA FOR STANDARD ASSET MIX

• In standard asset strategies risk is generally clustered in equity and interest rates, with the equity risk premium the dominating factor.



Equity Risk Premium
Small Cap Premium
Emerging Mkt Premium
Credit Risk Premium
Term Premium
Iliquidity Premium
Non-Corporate GDP Growth
Unexpected Inflation
Alpha

CHALLENGE OF MODELING RETURNS ON STYLES/PREMIA

- Styles showing most consistent long-run rewards
 - Value overweight assets with low valuations
 - Carry overweight assets with high income
 - Trend/Momentum overweight assets with recent high returns
 - Low Risk overweight assets with low beta or low volatility
 - Illiquidity overweight assets with low liquidity

	Average Return	Volatility	Sharpe Ratio	Start Year
Asset Class Risk Premia				
Global Equity	4,5	17.3	0.35	1900
World Term Premium	0.7	8.4	0.11	1900
US Term Premium	1.4	6.7	0.26	1952
US Credit Premium	0.3	4.4	0.06	1926
Alternative/Active Strategies				
Value (Global equity)	4.6	7.2	0.68	1975
Carry (Currency)	6.7	10.3	0.67	1978
Trend (Commodity Trend)	10.2	12.1	0.85	1961
Bet-against –Beta Composite	8.5	8.9	0.95	1965
Liquidity Risk Factor in Stocks	5.1	12.3	0.47	1968

Source: Antti Ilmanen, Expected returns (and Beyond), April 2012

CONCLUSIONS (1)

- Expected returns should be seen in broad, long term perspective
- However, there are clearly lessons learnt from 2008
- Moreover, the current economic and financial markets environment is in various ways unprecedented.
- In principle pre-crises approaches still hold, being eclectic combination of input from
 - Historical average returns
 - Theory
 - Forward looking market indicators
 - Discretionary views
- However, important to take into account irregularities due to exceptional environment
- Besides, there are a number of potential lessons learnt/potential improvements
 - Situation dependence of volatilities and correlations
 - More explicit use of stress testing
 - Appreciation of need of less static asset allocation
- Humility/high degree of uncertainty: expected returns are unobservable and our understanding of them is limited. Very dependent on where the macro economy will go.

CONCLUSIONS (2)

- Reconsidering asset allocation decision in view of
 - Lower expected returns
 - Gradual shift from equities into fixed income due to disappointing equity performance
 - Low return environment due to low expected growth and financial repression
 - Disappointing benefits from diversification over asset classes in crisis period
- The result
 - Investors are looking for higher yielding and uncorrelated assets/strategies in order to achieve return targets
 Include risk premia and factor returns
 - Investors rethinking their allocation strategy and in general their investment philosophy
 Risk based approach (risk budgeting)
- ALM modeling will have to incorporate these new approaches, as far as their impact is material