6 Asset Allocation Model

In this chapter, an asset allocation model is derived. Firstly, an optimization including several asset classes is performed. Secondly, microfinance debt is introduced into the asset allocation framework with input parameters derived from a quantitative analysis of the past. Thirdly, the qualitative assessment of the scenario process microfinance provides forward-looking return, risk and correlation estimates for the asset allocation framework. Finally, the results are compared and microfinance investment advices for different investor types proposed.

6.1 Data and assumptions

In the following, the data set for the asset allocation optimization is introduced. Return estimates are derived for all asset classes, however, risk parameters are obtained by a quantitative analysis of the past. Hence, besides the selection of asset classes and the underlying parameters, the indices for the derivation of risk parameters are presented.

6.1.1 Selection of asset classes and data

In general, the intention of an asset allocation process is a broadly diversified portfolio allowing an optimal return/risk profile and also taking liquidity aspects into account.[159] Therefore, an integration of a wide set of asset classes in the optimization process increases the diversification potential. As a result, equities, bonds, alternative investments and real assets are considered (see Figure 6-1).

[159] SPREMANN (2008), pp. 2.

P. M. Becker, *Investing in Microfinance*, DOI 10.1007/978-3-8349-8926-0_6

Asset Class	Index*
Money Market USD	3-months US Treasury bills (secondary market)
Equities World	MSCI World
Equities EM	MSCI EM
Gov Bonds World	Citigroup Global Bond G7
Gov Bonds EM	JPM EMBI+
Gov Bonds Inflation Linked	Barclays Global Inflation Linked Bond
Credit Bonds	Barclays Global Credit Bond
High Yield Bonds	Barclays Global High Yield
Convertible Bonds	UBS Convertible Bond
Cat Bonds	Swiss Re Cat Bond Index
Hedge Funds	CSFB/Tremont Hedge Fund Index
Private Equity	LPX Major Market
Real estate (REITs)	GPR 250 global
Commodities	Goldman Sachs Commodity Index
Microfinance debt	Dexia Microcredit Fund or scenario data

* All indices are total return and USD hedged

Figure 6-1: Asset classes and respective indices

Money market data are given by 3-months US treasury bills secondary market transactions. This investment is only subject to a US government default within the next three months.

The equity indices are total return indices from MSCI. The MSCI World index is a global equity index of 23 developed markets. The MSCI EM index consists of 23 emerging markets. Hence, there is no intersection of country exposure. In both indices dividends are reinvested.[160] The government bond indices are the Citigroup Global Bond G7 index for developed government bonds[161], the JPM EMBI+ as a standard index for emerging markets government bonds[162] and the Barclays Global

[160] MSCI BARRA (2010).
[161] CITIGROUP (2010). The index consists of G7 government bonds with a par amount of USD 12.620 billion. As of March 2010, the average coupon is 2.91%, the average maturity about 8 years and the duration is 6.3 years. The quality of the index is AA+ and the current spread to Libor -7 basis points.
[162] J.P.MORGAN (2010). The index consists of government bonds from 15 emerging markets with a par amount of USD 201 billion. As of March 2010, the maturity is about 13 years and the duration 7.35 years. The quality of the index is BB+ and the spread to US government bonds 300 basis points.

Inflation Linked Bond index for inflation linked government bonds.[163] Furthermore, the high yield and investment grade corporate bond indices are both Barclays total return indices.[164] The index considered for convertible bonds is the UBS Global Convertible Bond index.[165] Consequently, all these indices are retrieved from Datastream as total return indices and USD hedged.[166]

In the emergent cat bond market, the data history is limited. Swiss Re introduced in January 2002 several cat bond indices based on daily Swiss Re pricing indications.[167] This total return index for all outstanding USD denominated cat bonds is adequate for asset allocation purposes.

The asset classes "hedge funds", "private equity", "real estate" and "commodities" are measured by common listed benchmarks. For hedge funds, the CS/Tremont Hedge Fund index is considered.[168] It includes every hedge fund sector and provides an asset weighted total return performance of the hedge fund industry. The LPX major market index is selected as an index for private equity investments.[169] A listed private equity index is chosen as the illiquid structure of a non-listed private equity vehicle would require a profound understanding of risk and correlation estimates for this asset class. Hence, a further scenario process would be necessary. Therefore, the most common listed private equity total return index is chosen. Real estate investments somehow generate a similar problem. Accordingly, a very liquid investment structure of real estate is selected. The GPR 250 global is an index for real estate investments trusts (REITs).[170] The commodity sector is

[163] BARCLAYS CAPITAL (2010). The index consists of inflation linked government bonds from the US, United Kingdom, France, Japan, Germany, Canada and Sweden with a market value of USD 1.393 billion. The average maturity is about 11.5 years and the duration about 9.5 years.

[164] BARCLAYS CAPITAL (2010). The global credit index consists of corporate bonds with an outstanding market value of USD 8.608 billion. The average maturity is about 7.6 years and the duration 5.25 years. The global high yield bond index consists of corporate bonds with an outstanding market value of USD 1.177 billion. The average maturity is about 7.26 years and the duration 5.4 years.

[165] UBS (2008). The index represents global convertible bonds with an investment grade rating. It is calculated as a total return index.

[166] The corporate and high yield bond indices are total return since inception indices. This methodology is often applied by Barclays (formerly known as Lehman) credit bond indices. As a result, returns can only be calculated by adding 100 to the index measure.

[167] For more detailed information see Swiss Re (2007).

[168] For further information see Credit Suisse First Boston (2010).

[169] For further information refer to LPX (2009).

[170] For further information refer to GPR (2009).

indicated by the S&P Goldman Sachs Commodity index, which is mainly driven by energy components.[171] In conclusion, investments in alternative asset classes, real estate and commodities are proxied by common indices. However, these indices are often criticised to not reflect the respective asset class adequately.[172]

Microfinance investments are focused on microfinance debt. Firstly, fund data from the Dexia Microfinance Fund are considered. This approach is chosen to obtain results according to a standard quantitative asset allocation methodology. Secondly, the forward-looking data generated during the scenario analysis process for this asset class are integrated into an asset allocation framework.

6.1.2 Input parameters for portfolio optimization

The estimation of consistent input parameters is a key component for portfolio optimization processes. The data history of asset classes may give some information about estimated returns, risks and correlations. However, the generation of forward-looking estimates from past data is questionable (see chapter 2.4). It would negate any innovation and change of driving forces. As a result, a qualitative forward-looking estimation of input parameters is a more consistent approach.

A portfolio optimization is mainly driven by return estimates. According to Chopra and Ziemba (1993), the sensitivity of a mean-variance optimization to return estimates is about ten times higher than to standard deviation estimates and about twenty times higher than to correlation estimates. Consequently, correlation estimates and covariance have a minor impact on portfolio optimization.

6.1.2.1 Return estimates

The return estimates are generated by an analysis of a coherent set of regimes developed and implemented by LGT CM. For each asset class the return is estimated in eight macroeconomic regimes with a five year time horizon. These regimes include a “classic boom” scenario as well as a “deflationary depression” scenario. The expected return in every regime is derived by a quantitative assessment of past periods as well as a qualitative assessment of the future. This coherent mixture of both approaches results in a return estimate. Finally, a weighting of the regime

[171] For further information see Standard and Poor’s (2009).
[172] For the hedge fund universe see for example LHABITANT (2004), pp 87.

applies and hence an overall return estimate for each asset class can be calculated. In conclusion, the return estimates introduced in this asset allocation model are derived from the proprietary LGT CM long-term expected return regime framework.[173]

The return estimate for microfinance debt is generated differently. On the one hand the estimate is based on a quantitative analysis of the Dexia Microcredit Fund. On the other hand the qualitative results of the scenario process microfinance are introduced. All expected annualised returns are shown in Figure 6-2.

Asset Class	Expected return*
Money Market USD	2.0%
Equities World	8.5%
Equities EM	11.5%
Gov Bonds World	3.0%
Gov Bonds Inflation Linked	3.5%
Gov Bonds EM	4.0%
Credit Bonds	4.5%
High Yield Bonds	5.5%
Convertible Bonds	7.0%
Cat Bonds	4.0%
Hedge Funds	5.5%
Private Equity (listed)	12.0%
Real estate (REITs)	8.5%
Commodities	6.5%
Microfinance debt	DMF 4.5% / Scenario 4%

* annualised returns for five year forecast period

Figure 6-2: Expected returns for all asset classes

6.1.2.2 Risk and correlation parameters

The risk and correlation parameters are determined in a covariance matrix. The matrix is modelled with logarithmic monthly returns.[174] A ten year analysis period

[173] The LGT Capital Management return estimates are slightly modified and for proprietary reasons rounded to half percentages.
[174] Money market USD is calculated with 3-months US Treasury bills (secondary market).

is set from January 1999 until December 2009. This also corresponds with the availability of data for the Dexia Microfinance Fund. Consequently, a broad spectrum of market scenarios is included.

The risk parameter is mainly determined by historic standard deviations. However, this backward-looking approach may not include all risk components. A more sophisticated approach would be to implement a forward-looking risk matrix. In this study, the risk matrix is not the main objective. Therefore, the illiquidity risk, the main additional risk not projected in past standard deviations, is added as a risk measure. In conclusion, a standard deviation analysis for all asset classes is conducted on the above mentioned ten year data set and an additional illiquidity risk is added.

Illiquidity is also defined and measured as a risk. Investors have a preference for liquid investment strategies[175] and therefore an illiquidity discount for some asset classes is integrated into the variances and hence also the covariance matrix. In this study, the illiquidity discount of an investment is indicated by its bid-ask spread. However, this spread varies extremely over time. Consequently, the illiquidity is extremely costly in crisis situations, almost exactly when most investors would need liquid markets. Thus, an analysis of bid-ask spreads of all considered asset classes was performed with Bloomberg data or over-the counter offers in October 2008.[176] The equity asset classes (equity developed, emerging and REITs) as well as commodity trades had no major transaction cost disturbance. However, for several fixed income asset classes bid-ask spread increased.[177] Furthermore, also for other asset classes such as hedge funds, private equity and cat bonds the bid-ask spread increased or they were not tradable at all. Microfinance investments for instance were only limited tradable. The debt obligations are not tradable and hence only interest payments and maturing debt obligations generate liquidity. However, in a sell-off the liquidity may not be sufficient to serve redemptions. In conclusion, for several

[175] SPREMANN (2008), pp. 2. Moreover, SCHOLES & WILLIAMS (1977) triggered research regarding the impact of an assets' liquidity on its parameters.
[176] Over-the counter offers are derived from notes of portfolio managers from LGT Capital Management.
[177] In some cases, brokers even rejected trades at all, because they did not want to take the risk on the banks balance sheet.

asset classes an illiquidity risk is defined according to the increase of the bid-ask spread in October 2008 (see Figure 6-3).

Asset Class	Illiquidity risk
Money Market USD	0.0%
Equities World	0.0%
Equities EM	0.0%
Gov Bonds World	0.0%
Gov Bonds EM	0.5%
Gov Bonds Inflation Linked	0.5%
Credit Bonds	1.5%
High Yield Bonds	1.5%
Convertible Bonds	1.5%
Cat Bonds	7.5%
Hedge Funds	7.5%
Private Equity (listed)	7.5%
Real estate (REITs)	0.0%
Commodities	0.0%
Microfinance debt	7.5%

Figure 6-3: Illiquidity risk for each asset class

In this asset allocation model process, three different covariance matrices apply. Firstly, a correlation and a covariance matrix excluding microfinance are calculated (see Appendix– 4). Secondly, the initial covariance matrix is complemented by data of a quantitative analysis for microfinance debt investments (see Appendix– 5). These two covariance matrices can be calculated with quantitative analysis of past data supplemented with the illiquidity risk measure.[178] Thirdly, the initial covariance matrix is complemented with qualitative parameter for microfinance debt from the scenario process. The risk of microfinance debt investments is estimated and hence the variance can be calculated. Furthermore, the correlations with emerging equities and government bonds allow the calculation of covariances with these two asset classes. The derivation of correlations with all other asset classes is performed

[178] The correlation of asset classes and the standard deviation define the covariance of two asset classes. All parameters are obtained from the ten year data set with one exception – for the CAT bond index a shorter period applies. Moreover, the illiquidity risk is added to the past standard deviations.

in a factor loading approach following Fama-French (1993). In this study, factor loadings are calculated for each asset class using the correlation of each asset class with the two factors EM equities and EM bonds. As a result, a new covariance matrix with $B'\Omega B$, where B is a matrix of factor loadings and Ω is the covariance matrix of the factors, can be calculated. From this covariance matrix a correlation matrix is derived. In this case, the estimation with just two factors leads to an overestimation of correlations of all asset classes with microfinance debt. For this reason, just the ranking of the correlations is considered and new correlation estimates are generated in line with the two given correlation estimates for EM equities and EM bonds (see Figure 6-4). Finally, the existing covariance matrix is complemented with the new estimates for microfinance debt (see Appendix– 6).[179] In conclusion, three different correlation and covariance matrices are used in the portfolio optimization process.

[179] The qualitative generation of correlation estimates in a group process is time-consuming. Above all, the qualitative estimation of correlations for several asset classes with market and macroeconomic factors is a complex analysis. Moreover, correlations may vary over time, which was impressively demonstrated during a peak of the financial crisis in fall and winter 2008/09. Therefore, the chosen approach during the scenario process to derive only two correlation estimates for very common asset classes is arguable, but adequate especially with respect to the minor impact of covariance parameters on the portfolio optimization process (see chapter 6.1.2).

	Correlation in factor loading model	Correlation rank in factor loading model	Correlation estimate applied
Gov Bonds EM			**0.5**
Gov Bonds Inflation Linked	0.994	1	0.4
Equities EM			**0.3**
Credit Bonds	0.991	2	0.3
Cat Bonds	0.980	3	0.2
Gov Bonds World	0.976	4	0.2
Money Market USD	0.970	5	0.2
High Yield Bonds	0.888	6	0.2
REITs	0.782	7	0.1
Convertible Bonds	0.773	8	0.1
Hedge Funds	0.675	9	0.1
Equities World	0.535	10	0.1
Private Equity	0.529	11	0.1
Commodities	0.328	12	0

Figure 6-4: Deriving correlation estimates for microfinance debt from a factor loading model

Finally, a parameter set with all required inputs for an asset allocation optimized is defined. Figure 6-5 shows the return estimates and risk assumptions of each asset class as well as a correlation estimate with microfinance based on the quantitative approach and the scenario process.

	Expected return	Expected risk	Expected correlation with microfinance	
			Quantitative approach	Qualitative approach
Money Market USD	2.0%	0.5%	0.02	0.2
Equities World	8.5%	18.0%	0.00	0.1
Equities EM	11.5%	25.7%	-0.01	0.3
Gov Bonds World	3.0%	7.0%	0.00	0.2
Gov Bonds Inflation Linked	3.5%	8.7%	0.01	0.4
Gov Bonds EM	4.0%	11.0%	0.00	0.5
Credit Bonds	3.5%	9.1%	0.01	0.3
High Yield Bonds	6.0%	12.9%	0.00	0.2
Convertible Bonds	7.0%	14.6%	-0.01	0.1
Cat Bonds	4.0%	12.3%	0.00	0.2
Hedge Funds	5.5%	14.1%	0.00	0.1
Private Equity (listed)	12.0%	36.2%	-0.01	0.1
Real estate (REITs)	8.5%	22.4%	0.01	0.1
Commodities	6.5%	26.6%	-0.02	0.0
Microfinance debt	Quant. 4.5% / Qual. 4%	Quant. 8.5% / Qual. 13.5%	1.00	1.0

Figure 6-5: Return, risk and correlation parameters at a glance

6.2 Asset allocation optimization excluding microfinance

In this section, the asset allocation optimization with given parameters excluding microfinance is outlined. For this process, the same model and parameters as in section 6.3 will be used. Accordingly, a direct comparison of the effects of microfinance investments will be possible.

The portfolio optimization process is a mean-variance approach. Several risk profiles of investors are investigated. The idea of this optimization is to set-up a long-term asset allocation. Hence, the transaction costs are excluded and no prior portfolio weights of the asset classes exist. The only constrain is an upper boundary for money market investments of 20%.[180] In Figure 6-6 the optimized portfolios excluding microfinance investments for several lambdas[181] are revealed. Furthermore a Telser shortfall for the optimized portfolio is calculated. The minimum return is set as 0% and the shortfall has a maximum probability 5%.[182]

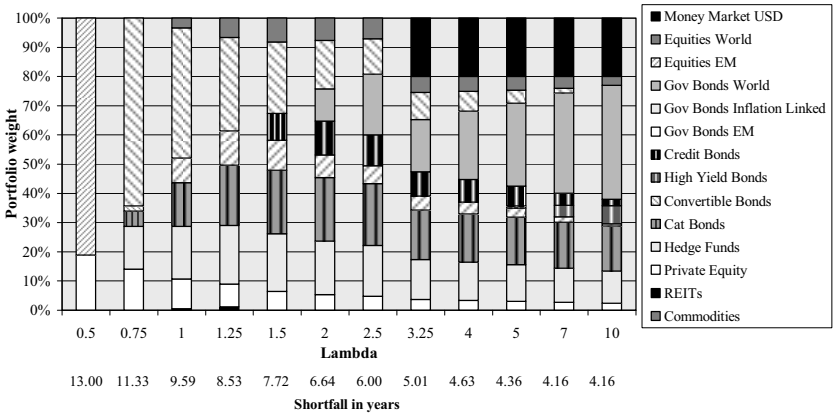

Figure 6-6: Optimized portfolio weights excluding microfinance

[180] Clients are not willing to pay for portfolios that invest strategically considerable amounts in money markets. The maximum money market allocations of funds in practice are about 20-30%.

[181] Lambda is a risk aversion factor of the investor (see also chapter 2.3).

[182] The shortfall concept allows a minimum investment return. In many cases, investors request a positive return. As a result, the minimum return should be 0%. Moreover, a shortfall might occur with a given probability. In this study a shortfall of 5% is chosen.

The optimized portfolios indicate the huge difference between investors. Very risk-averse investors clearly prefer money market, government and special bond investments. As the willingness to take risks increases, investors prefer more risky investments such as convertible bonds or high yield, hedge funds and equity investments. However, in this optimization a clear preference for bond risks over equity risk compared to standard optimization applies. Furthermore, dependent on the investors' risk preference the equity risk is increasingly taken in emerging markets. Finally, this optimization advises risky investors to allocate their wealth mainly in emerging market equities and to some extent in private equity. Four asset classes are not considered in this optimization. Emerging market government bonds and inflation linked bonds have a comparably high risk. However, in a qualitative analysis this result might differ. Moreover, the analysis of commodities and real estate exposure via REITs reveals the high risk of those investments. Therefore, all four asset classes are not considered in any portfolio. In conclusion, the optimized portfolios have a clear preference for credit and bond risks and avoid very high risk asset classes. Credit asset classes such as investment grade, convertible and cat bonds are a major segment as well as hedge funds. This view has also been expressed lately from some experienced investors, e.g. Ray Dalio from Bridgewater.

6.3 Asset allocation optimization including microfinance

6.3.1 Optimization with quantitative microfinance parameters

In this section, the asset allocation optimization with quantitative microfinance parameters introduced in section 4.4 and described in chapter 6.1 is presented.

The portfolio optimization process is identically to the one outlined above for investments excluding microfinance. The only constraint for portfolio weights is a maximum of 20% of money market investments. Figure 6-7 shows the portfolios optimized with quantitatively derived input parameters for microfinance debt investments.

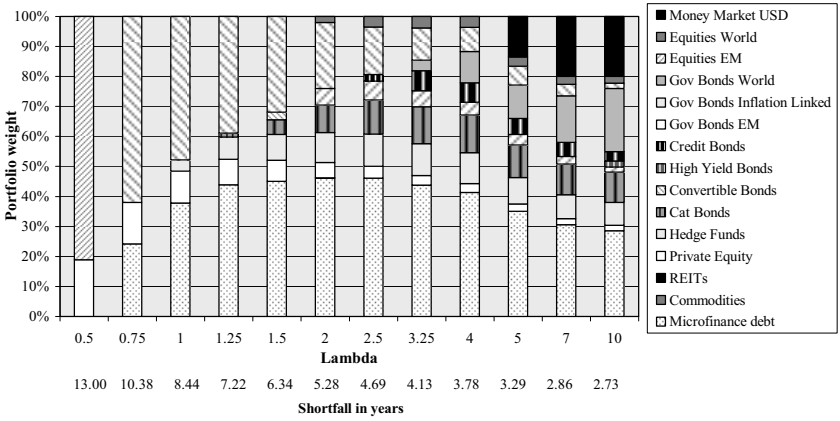

Figure 6-7: Optimized portfolios weights including microfinance (quantitative approach)

Microfinance debt investments have a surprisingly high quota in almost all portfolios. In defensive portfolios a microfinance weight of more than 25% applies. Moreover, with increasing risk more and more microfinance exposure is added at cost of money market and government bond quotas. The exceptions are portfolios with a shortfall markedly above ten years. In these portfolios the allocation focuses on EM equities and private equity. Overall, the portfolios are characterized by the microfinance debt investment. As a result, the high microfinance allocation lowers portfolio risk and hence shortfall markedly.

At first sight the results given by that asset allocation optimization are astonishing. However, the assumptions for microfinance debt investments might not be correct despite adding illiquidity risk. The quantitative history of microfinance investments is short and does not allow an adequate estimation of return, risk and liquidity parameters. Nonetheless, the result exhibits the potential of microfinance investments as a module in strategic asset allocation. Consequently, an analysis with qualitatively derived input parameters might give a more conclusive asset allocation.

6.3.2 Optimization with qualitative microfinance parameters

In this section, the asset allocation optimization with parameters of the scenario workshops is outlined. Hence, scenario results for microfinance debt investments are included into the previously used asset allocation framework.

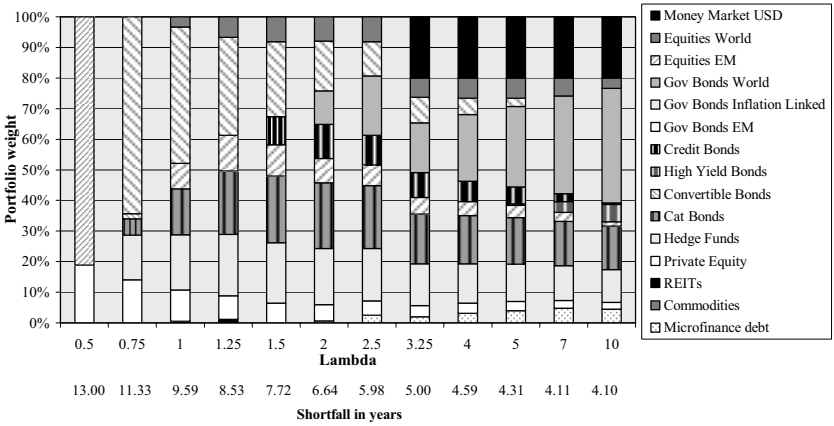

Figure 6-8: Optimized portfolios weights including microfinance (qualitative approach)

Microfinance debt investments have a moderate weight in many portfolios, which mainly correspond to the portfolios without microfinance exposure. In portfolios with a shortfall up to 6 years microfinance debt has a quota of about 2.5-5%. In more aggressive growth portfolios with a shortfall above 7 years, microfinance debt is not added to portfolios. This primarily reflects the lower expected return and higher expected risk of microfinance debt than expressed in purely quantitatively derived parameters. However, it also states the attractiveness of microfinance investments for risk-averse investors. In conclusion, the portfolios are well-balanced between several asset classes and the portfolios with a lower risk-profile have a moderate microfinance weight.

6.4 Implication for asset allocation

6.4.1 Cross-comparison of portfolios

The three sets of portfolio compositions (two with and one without microfinance investments) have different characteristics. A cross-comparison of selected optimized portfolios reveals the differences of portfolios without microfinance, with quantitatively derived microfinance expected parameters and with qualitatively derived microfinance expected parameters (see Figure 6-9).

	lambda 1			lambda 3.25			lambda 7		
	w/o MF	MF quant	MF qual	w/o MF	MF quant	MF qual	w/o MF	MF quant	MF qual
Money Market USD	0.0%	0.0%	0.0%	20.0%	0.0%	20.0%	20.0%	20.0%	20.0%
Equities World	3.4%	0.0%	3.4%	5.5%	3.9%	6.3%	4.0%	2.6%	5.8%
Equities EM	44.5%	47.9%	44.5%	9.2%	10.8%	8.3%	1.7%	3.9%	0.0%
Gov Bonds World	0.0%	0.0%	0.0%	17.9%	3.5%	16.3%	34.2%	15.5%	31.9%
Gov Bonds Inflation Linked	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Gov Bonds EM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Credit Bonds	0.0%	0.0%	0.0%	8.3%	6.7%	8.2%	4.2%	4.7%	2.5%
High Yield Bonds	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	3.6%
Convertible Bonds	8.4%	0.0%	8.4%	4.9%	5.2%	5.5%	1.8%	2.6%	2.9%
Cat Bonds	15.0%	0.0%	15.0%	16.8%	12.3%	16.3%	15.7%	10.2%	14.4%
Hedge Funds	18.0%	3.7%	18.0%	13.7%	10.6%	13.6%	11.7%	7.9%	11.4%
Private Equity	10.2%	10.6%	10.2%	3.7%	3.2%	3.7%	2.7%	2.1%	2.6%
REITs	0.5%	0.0%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Commodities	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Microfinance debt	0.0%	37.8%	0.0%	0.0%	43.8%	1.9%	0.0%	30.6%	4.8%
Return p.a.	**8.85%**	**8.68%**	**8.85%**	**5.05%**	**5.77%**	**5.04%**	**4.09%**	**4.39%**	**4.07%**
Risk p.a.	**16.66%**	**15.33%**	**16.66%**	**6.87%**	**7.13%**	**6.86%**	**5.07%**	**4.52%**	**5.02%**
Shortfall in years	**9.59**	**8.44**	**9.59**	**5.01**	**4.13**	**5.00**	**4.16**	**2.86**	**4.11**

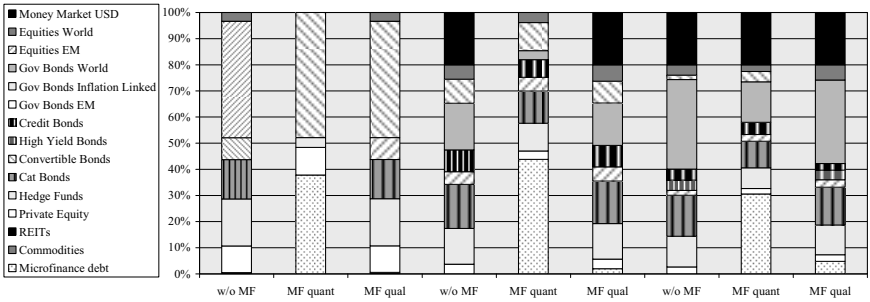

Figure 6-9: Cross-comparison of selected portfolios

The portfolios with a lambda of 1 are exemplary for long-term investors. The portfolio without microfinance holds about 50% in equities with a clear tilt towards emerging markets, another 10% in private equity, close to 20% in hedge funds, 15% in well-diversifying cat bonds and the remaining 8% in convertible bonds. The

portfolio has an annual expected return of 8.8% and an annual expected risk of 16.7%. As a consequence, the Telser shortfall with 0% minimum return and a maximum shortfall probability of 5% is about 9.6 years. The introduction of microfinance debt investments based on a standard quantitative approach would change the portfolio allocation extremely. In such a portfolio, microfinance debt has a weight of about 38%, emerging market equities again close to 50%, private equity exposure of 10% and some 4% of hedge fund exposure. The diversifying exposures of cat bonds, convertible bonds and hedge funds are completely or almost completely shifted into microfinance debt investments. As a result, the expected annual return is with 8.7% similar to the portfolio without microfinance. But the expected annual risk is lowered by more than 1% to 15.3% due to the low risk expectation of microfinance debt investments. Therefore the Telser shortfall criteria are expected to be met with a minimum investment period of only 8.5 years. The portfolio with qualitatively derived expected input parameters is identical to the one without microfinance. For long-term investors no microfinance debt investments are recommended from a portfolio theory perspective.

The portfolios with a lambda of 3.25 are exemplary for investors that prefer a growth portfolio with moderate risks. The optimized portfolio without microfinance investments is well-diversified ranging from money market, equities, government bonds, credit and convertible bonds, cat bonds and hedge funds to a small portion of private equity. The expected annualised return is 5.1% and the expected annualised risk 6.9%. As a result, the shortfall constraints are met after an expected investment period of 5 years. Again, the inclusion of microfinance with standard quantitative parameters causes a major shift of the portfolio. More than 40% are invested in microfinance debt mainly at the expense of the money market exposure, government bonds, credit bonds investments and hedge funds. Consequently, the expected return rises to 5.8% per annum and the risk is expected to be 7.1%. Thus, the shortfall is significantly lower than in the portfolio without microfinance. It is reduced by almost one year to about four years. The optimized portfolio with qualitatively derived input parameters during the scenario analysis generates a different allocation. The microfinance debt exposure is comparably moderate with about 2%. This quota is mainly at the expense of government bond and cat bond investments. However, the diversification aspect also leads to a shift from emerging market equity

exposure to developed market equity exposure. This makes intuitively sense and is an indication for an adequate covariance matrix. As a consequence, the expected return is 5.0% and the expected risk 6.9%. Hence these parameters and the shortfall of five years are almost identical to the portfolio without microfinance.

The portfolios with a lambda of 7 are exemplary for risk-averse investors. The portfolio without microfinance contains 20% money market exposure, about 35% government bonds, about 8% credit and high yield bonds, 15.7% cat bonds, 11.7% hedge funds and some minor exposure of about 6% to equities and 2.7% to private equity. As a result, an expected return of 4.1% and expected risk of 5.1% apply. The shortfall criteria are met with an investment period of at least 4 years and 2 months. The portfolio calculated with quantitatively obtained microfinance debt investment parameters differs again widely. The microfinance exposure of 30% results mainly at the expense of government bonds world and cat bonds. Overall, the expected return is 4.4% and the expected risk 4.5%. Consequently, the shortfall is more than one year below the shortfall period without microfinance investment. In the portfolio optimized with microfinance input parameters of the scenario analysis, the microfinance quota is comparably moderate with about 5%. This results at the expense of a moderate reduction of government bonds and cat bonds. Some slight shifts in bond exposure result from credit risk to equity risk in convertible bonds. Furthermore, again the equity risk is focused on developed markets. In conclusion, an expected return of 4.1% and an expected risk of 5.0% apply. The resulting shortfall period is with 4.1 years slightly lower than in a portfolio without microfinance investment.

The comparison of the efficient frontiers depicts the portfolio effects of microfinance debt investments. Investors with a high or moderate risk aversion can benefit slightly from a microfinance allocation in their portfolio (see Figure 6-10). Furthermore, the figure shows the extreme overestimation of microfinance debt investments in portfolio theory applying quantitatively derived input parameters. In conclusion, the “scenario analysis microfinance” and the integration into an asset allocation model reveal only very moderate portfolio effects of microfinance debt investments for risk-averse investors with a short- or mid-term investment horizon. Furthermore, the asset allocation modelling exhibits a marked overestimation of microfinance debt investments by standard quantitative approaches.

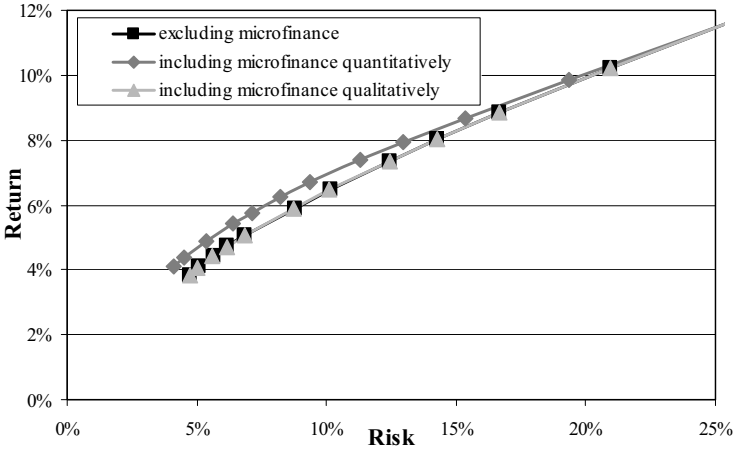

Figure 6-10: Efficient frontiers of portfolios without and with MF debt

6.4.2 Cross-comparison of portfolio backtests

A cross-comparison of portfolio backtests indicates no clear preference of portfolios with or without microfinance. On the one hand, the portfolios without microfinance performed better in the last year (Figure 6-11). However, over the long-term the return differences between the portfolios excluding and including microfinance diminish. On the other hand, microfinance investments reduce the risk of these portfolios slightly. Over the past few years, microfinance debt investments optimized portfolios only for very risk-averse investors. Hence, the shortfall of the lambda 7 and lambda 10 portfolios is in the long-run lower than for the corresponding portfolios without microfinance. But for all other investors (lambda 2-5), microfinance debt investments did not optimize the portfolios in any examined time horizon. Nevertheless, past performance is no indication of future performance. Furthermore, the return and risk expectations as well as liquidity risks associated with other asset classes changed markedly during the past few years. As a consequence, these backtests clearly demonstrate that microfinance investments offer attractive diversification with the limited up- and also downside of hold-to-maturity fixed income products.

		lambda 2		lambda 2.5		lambda 3.25		lambda 4		lambda 5		lambda 7		lambda 10	
		w/o MF	MF qual	w/o MF	MF qual	w/o MF	MF qual	w/o MF	MF qual	w/o MF	MF qual	w/o MF	MF qual	w/o MF	MF qual
-1y	return p.a.	28.4%	28.2%	24.4%	23.9%	19.0%	18.7%	16.7%	16.1%	14.8%	14.0%	12.8%	12.0%	11.4%	10.8%
	risk p.a.	12.9%	12.8%	11.4%	11.3%	9.0%	8.9%	8.2%	8.0%	7.5%	7.3%	6.7%	6.4%	6.2%	5.9%
	shortfall	*0.56*	*0.56*	*0.60*	*0.61*	*0.60*	*0.60*	*0.65*	*0.67*	*0.70*	*0.74*	*0.74*	*0.79*	*0.79*	*0.81*
-3y	return p.a.	2.9%	2.8%	3.4%	3.2%	3.2%	3.0%	3.5%	3.3%	3.8%	3.5%	4.2%	3.9%	4.6%	4.5%
	risk p.a.	14.6%	14.6%	12.0%	11.9%	9.1%	9.0%	7.8%	7.7%	6.8%	6.6%	5.8%	5.5%	5.1%	4.9%
	shortfall	*71.38*	*73.24*	*33.28*	*36.59*	*22.33*	*24.50*	*13.53*	*14.98*	*8.66*	*9.66*	*5.04*	*5.39*	*3.33*	*3.16*
-5y	return p.a.	5.8%	5.7%	5.4%	5.3%	4.9%	4.8%	4.7%	4.5%	4.5%	4.3%	4.4%	4.2%	4.3%	4.3%
	risk p.a.	9.6%	9.6%	8.2%	8.1%	6.4%	6.4%	5.7%	5.5%	5.1%	4.9%	4.4%	4.2%	4.1%	3.9%
	shortfall	7.52	7.55	6.15	6.26	4.74	4.83	3.99	4.05	3.40	3.45	2.80	2.76	2.42	2.21
-10y	return p.a.	4.5%	4.5%	4.5%	4.4%	4.1%	4.0%	4.1%	4.0%	4.1%	4.0%	4.2%	4.0%	4.3%	4.2%
	risk p.a.	7.8%	7.8%	6.5%	6.5%	5.1%	5.0%	4.5%	4.4%	4.0%	3.9%	3.6%	3.4%	3.4%	3.2%
	shortfall	7.95	7.99	5.63	5.75	4.11	4.16	3.20	3.25	2.57	2.60	1.99	1.97	1.70	1.60

Figure 6-11: Cross-comparison of portfolio backtests without and with MF debt[183]

6.4.3 Implications for investors

The implications of microfinance debt in an asset allocation context are diverging depending on the investor type. In the following, recommendations for the investor categories defined in chapter 2.3 are outlined. These asset allocation recommendations are mainly based on the optimization with qualitatively derived microfinance debt investment input parameters.

Very risk-averse private investor

Microfinance debt investments are a source of return for very risk-averse portfolios. These investors seek for a stable portfolio with capital preservation and in second place growth and final wealth. On the one hand the mixture of emerging market and credit exposure offered by microfinance debt investments diversifies the asset allocation. On the other hand microfinance debt investments offer an expected return more or less equivalent to the expected portfolio return. Moreover, microfinance investments offer an additional social return for the investor. In conclusion, depending on the specific risk-aversion and investment horizon as well as social motivation of an investor the microfinance debt investment exposure is recommended in the range of 2-5% of the investors' portfolio.

[183] The investigated period ends in February 2010. A monthly rebalancing is assumed and returns are calculated from indices stated in Figure 6-1.

Risk-averse wealthy private investor

For risk-averse wealthy private investors' portfolios microfinance debt investments are a source of diversification. These investors aim for a well-diversified portfolio with some growth potential. Microfinance debt investments offer diversification potential. Furthermore, the asset class adds a different return component into the portfolio. On top of this, the investment generates a social return in the emerging markets. This and the increasing popularity of microfinance may generate an additional emotional return for the investor as an interesting topic for discussion in business and private life emerges. In conclusion, depending on the specific risk-aversion and investment horizon as well as social and emotional motivation of an investor, the microfinance debt investment exposure is recommended in the range of 2-4% of the investors' portfolio.

Long-term investing family office

Family offices prefer a long-term growth potential. As a consequence, the portfolio of a family office is very well-diversified in asset classes with high expected returns. This includes equities, the more risky bonds categories such as high yield bonds and convertible bonds as well as cat bonds, hedge funds for diversification and private equity investments. Standard microfinance debt investments are not a reasonable asset class. However, microfinance debt funds with non-hedged local currency exposure offer a higher return potential and access to otherwise non-investable exposures. Furthermore, the investment in microfinance equity as a portion of the private equity quota opens up further broadly untapped investments. As a consequence, microfinance is not a standard investment for family offices. Nevertheless in some niches attractive investments may arise, but funds and investable products are very limited.

Pension fund

Microfinance debt investments are not a preferred asset class per se for pension funds. Due to the illiquidity combined with the moderate return potential, the attractiveness for liquidity and return-seeking pension funds is limited. However, in several countries investment restrictions and guidelines with a social component apply. These constraints may in some cases make a microfinance debt investment

reasonable. In conclusion, unless social and sustainable guidelines apply microfinance debt investments are not fitting into a pension funds asset allocation.

State investment fund

The very long-term investment horizon of sovereign wealth funds does not correspond with the benefits of microfinance debt investments. Hence, standard microfinance investments are not attractive. However, high risk local currency exposure or microfinance equity investments may offer an attractive return potential. Moreover, a political interest in the microfinance sector of the own or some partner countries can also be a reason for an allocation. In general, despite political interest or very specific high risk exposures microfinance investments are not attractive for state investment funds.

6.4.4 Microfinance investment limitations

A further limiting factor for investments in microfinance is the market size. As mentioned, the volume of foreign equity and debt investments is currently about USD 6.5 billion. Therefore, a broad shift of private and institutional investors is impossible. For example, the whole microfinance market open for foreign investments is about a tenth of Bill Gates' wealth, about 5% of a medium-size private bank's assets under management or less than 0.5% of the biggest wealth managers' assets under management. In conclusion, microfinance investments are an asset allocation solution for smart private investors and not a product for the mass market. From an asset allocation perspective the attractiveness for big institutional investors is even further reduced by the small market volume as no reasonable exposure can be taken.

6.5 Summary

Microfinance debt investments optimize portfolios of risk-averse investors. The moderate correlation and paired with an attractive fixed income risk-return profile make microfinance debt investments favourable for risk averse private investors. The emerging market exposure with a relatively low risk and the fast adaptation to change in interest rates are two suitable key characteristics for balanced portfolios with a lower risk budget. As a result, an exposure of 2-5% for risk-averse private investors is recommended. Investors with a higher risk budget might prefer local

currency microfinance debt exposure or even private equity-like investments in microfinance equity. However, investors should take liquidity constraints and the limited markets size into account.