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The Problems of Correlation in the Financial Risk Management – the Contribution of Microfinance[#]

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ABSTRACT

In this paper we first introduce microfinance institutions as an alternative investment instrument. We argue that beside socially responsible features of microfinance, there exists also significant portfolio enhancement opportunity in microfinance investments. Then we provide an overview of possible ways how to evaluate the correlation between microfinance related financial instruments and conventional financial market measures of risk and return.

Key words: Microfinance, Investment, Funds.

JEL classification: G11, G21

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1. The Introduction to Microfinance

Microfinance is foremost known for providing microloans to small entrepreneurs in developing countries who lack the access to credit from formal financial institutions. The provision of microloans is characterized by small amounts that are lent, group lending mechanism, regular repayment schedules and the short-term nature of loans. High administrative cost of this kind of banking are compensated for by rather high annual rates of interest. MFIs' interest rates can range from 18 to 60 percent, depending on the conditions in each MFI's service area (Grameen Foundation: <http://www.grameenfoundation.org>).

Access to credit, however, can be critical as microfinance institutions' customers are in vast majority the poorest or low-income microentrepreneurs¹ who would not otherwise be served by commercial banks because they are considered high risks due to the lack of collateral and/or credit history. They seek credit in order to set up or manage their own business that may range from making handcrafts, tortilla-making business to running small neighborhood shops. In addition, according to Bauer, Chytilová and Morduch (2008), the structure of microcredit loan contracts helps to accumulate capital to people with self-discipline problems who lack suitable saving devices that foster regular deposits and that limit withdrawals. Even though the credit provided is not meant to cover daily financial needs of poor households (from developed markets' point of view microloan is an investment loan instead of a consumer loan), poor households running their own business often do not distinguish much in this respect. According to Cull, Demirgüç-Kunt and Morduch (2008) microloans are especially important with respect to their ability to expand households' abilities to cope with emergencies, manage cash flows, and invest for the future – basic financial capabilities that most of us take for granted but that are especially critical for low-income households operating on tight margins.

Microfinance is not a panacea for a wide-scale poverty eradication, but it is perceived as a tool for economic development and aiding the poor. Its uniqueness could be found in its role in the promotion of self-employment as well as gender empowerment (as the main focus of microfinance institutions is on women customers). Cull, Demirgüç-Kunt and Morduch (2008) see microfinance as a vision of poverty reduction that centers on self-help

¹ Cull, Demirgüç-Kunt and Morduch (2008) distinguish between the poorest and low-income customers that are poor but substantially better off than the poorest.

rather than direct income redistribution. We could argue to what extent the microfinance programs have been successful in their mission of poverty elimination (many case studies and research projects have profoundly addressed this issue), nevertheless all agree that the microfinance itself is not a general instrument how to reach economic growth on a national level and poverty reduction.

The microfinance movement has evolved since 1970s when first MFIs were set up and today's microfinance involves also other services beyond microcredit such as microsavings, insurance, remittances as well as training and advisory programs. The performance of MFIs in current financial crisis and their relation to general financial conditions and developments is covered by Dokulilova, Janda, and Zetek (2009).

Microfinance institutions (MFIs) constitute one type of alternative financial institutions (AFIs) whose crucial objective is social rather than financial, i.e. to serve underprivileged customers. Among other AFIs are financial cooperatives/mutuals, low-capital rural banks, state agricultural and development banks and postal saving banks. All of these financial institution focus to some degree on extending financial services downward from the economic level of the traditional clients of commercial banks (Christen, Rosenberg and Jayadeva, 2004). We refer to these institutions as institutions which have a double bottom line, i.e. they seek social or development objective in addition to financial objective.² In general, what sets the most MFIs apart from other AFIs is its mission of serving poor and the near-poor,³ and not only low-income clients or the under-banked.

The term microfinance institution (MFI) comprehend several different institutions with various legal statutes associated with different ultimate objectives, business models and preponderant systems of financing. As far as major objectives of particular MFIs are concerned, we distinguish between non-profit and for-profit organizations according their ability to distribute accrued profits (if applicable). While a non-profit organization is not eligible to carry the profit off the company by distributing it to its investors and has to reinvest it, pro-profit entities may dispose of after-tax profits whatever way they wish to. The microfinance movement gathered its force especially in the 1980s when a lot of new MFIs

² Double bottom line is a business term used in socially responsible enterprise and investment. While all businesses have a conventional bottom line to measure their fiscal performance - financial profit or loss - enterprises which seek a second bottom line look to measure their performance in terms of positive social impact (<http://en.wikipedia.org>).

³ For the purpose of global aggregation and comparison of poverty worldwide, the World Bank uses as the international poverty lines set at USD 1.25 and USD 2 per day (in 2005 Purchasing Power Parity terms) and defines extreme poverty and median poverty as living on less than USD 1.25 and USD 2 per day respectively.

were established worldwide. Most of the MFIs started as NGOs while some of them transformed themselves into formal regulated entities. Taking into account the institutional type of MFIs, we can divide existing organizations in several categories.

1. Non-governmental organizations (NGOs) have non-profit status and a particular social mission, i.e. in case of NGO MFIs it is poverty alleviation in developing countries by means of providing loans to the poorest clients. They do not have real owners and their funding is provided by donors as grants (of both debt and equity), or by concessionary loans bearing no or a below-market rate of interest. At the same time they are often spared from the weight of inconvenient regulation and taxes. They are credit-focused and in most of the cases do not take deposits as local laws does not admit it.
2. Non-bank financial institutions (NBFIs) that include both for-profits and non-profit organizations are specially regulated in return for being allowed to assume additional roles, including, for some, taking deposits (Cull, Demirgüç-Kunt and Morduch, 2008).
3. Commercial bank MFIs are likely to be pro-profit and rely to a larger extent on commercial funds (both debt and equity funding) and deposits. This category consist of both microfinance banks with microfinance as their main activity as well as of number of commercial banks who established specialized departments within the bank to focus on poorer clients.
4. Credit unions or credit cooperatives based on the principle of shared ownership of its members who have each one vote in the decision-making process. Credit unions generate funds in particular from owners'/members' deposits to whom they also provide loans. While in general credit unions cover operating cost by own capital, they may, however, take advantage of external funding via commercial loans, for example.

To cover their costs and activity expansion both for-profit and NGO microfinance organizations may dispose of own sources of capital from retained earnings if profit is generated. Even though some MFIs proved to be profitable this is not the case of the majority of microfinance institutions. External forms of funding play therefore an important role. MFIs' external funding may take different forms - from donations, grants and non-commercial loans to deposits and private capital. The extent to which individual MFIs take advantage of

particular types of funding varies and it is to a large extent derived from their institutional status. External funds then may vary in terms of the use they are destined for as well as the entity they come from. They could be aimed either to cover initial start-up or ongoing running costs or as own sources of capital for on-lending activities. These funds may come either from local government or other national entities as well as from international investors.

2. The Literature Review of Possible Contribution of Microfinance to Financial Risk Management

An interesting feature of microfinance institutions from the point of view of portfolio risk management is the difference of MFIs from other investment opportunities. This difference is captured in the correlations between market measures and relevant measures of MFIs. This interesting and potentially practically useful idea of unique potential of MFIs for portfolio enhancement and diversification was recently investigated in several research papers.

Gonzalez (2007) conducted an empirical study on MFIs' asset quality as a proxy for the risk of MFI portfolios that focuses on its resilience national macroeconomic shocks measured by changes in GNI (gross national income) per capita. The analysis of Gonzales shows a statistically significant correlation of changes in GNI only with respect to the portfolio-at-risk over 30 days indicator while for the remaining three any significant impact of domestic macroeconomic events on portfolio quality has not been proved. A strong resilience of microfinance institutions to domestic economy has not, however, been confirmed by a recent study by Kraus and Walter (2008).

Kraus and Walter (2008) examine the correlation of microfinance institutions' performance to international as well as to respective local markets with an objective to find out whether an addition of microfinance assets to portfolio represents an attractive opportunity for an investor seeking portfolio diversification. In terms of absolute market risk interconnection, they found that MFIs are not correlated with global capital markets while in as for the domestic economy correlation they found some significant results. In relative terms, compared to benchmark institutions, MFIs showed to be significantly less correlated to global market risk than other examined emerging market financial institutions and businesses. Kraus and Walter concluded, that "MFIs may have useful diversification value for international

portfolio investors able to diversify away from country risk exposures. For emerging market domestic investors, who may have this ability to a much more limited extent, domestic microfinance investments do not seem to provide significant portfolio diversification advantages” (Kraus and Walter, 2008).

Also a recent work of Galema, Lensink & Spierdijk (2008) investigates whether adding microfinance funds to a portfolio of risky international assets (equity and bond investment) is beneficial and yields diversification gains. They suggests that, in general, microfinance may be attractive for investors seeking a better risk-return profile and more specifically that microfinance investment may be valuable as an addition to the debt part of a globally diversified portfolio.

3. The Proposed Research Program for Investigation of Correlations Between MFI and Relevant Market Measures

3.1 The Special Features of Microfinance Institutions

The objective of our research is to analyze risk characteristics and performance of selected microfinance investment funds against given equity and fixed income indices over a defined study period. The advantage of evaluating directly microfinance investment funds is that we shall base our study on their monthly net asset values and therefore may use much more recent data than it was the case of previous studies mentioned in the literature survey (that used annual data based on MFI's annual financial reports). By doing so, we may already examine some first impacts of the recent turmoils on financial markets.

Microfinance investment funds or microfinance investment vehicles (MIVs) are special investment vehicles with a sole (or main) focus on the microfinance sector. MIVs are structures that propose a collective investment in a wide and diversified spectrum of microfinance institution. They play a vital role in microfinance since, as previously mentioned, they channel about half of the funds flowing to the microfinance sector. MIVs comprise a broad spectrum of vehicles that vary in legal structure, founding institution's origin, commercial orientation, investor base and fund's composition. The term of microfinance “fund” is commonly used instead of investment vehicle despite the fact that in legal sense many of them are not necessarily investment funds *in the proper sense of the term* as it is widely understood in financial markets (e.g. mutual funds). We, as well, shall use those two terms interchangeably if not specified otherwise.

To assess the strength (in terms of both the risky nature of investment and returns offered) of the microfinance investment funds sector we shall (similarly to the work by Galema, Lensink & Spierdijk, 2008) refer their attributes to the global stock and fixed income markets as well as to alternative emerging market asset classes. Precisely, we shall ask whether microfinance investment funds show any significant correlation with global developed markets as well as emerging markets in the first time. If this is not the case we could argue that microfinance funds represent a valuable portfolio diversification opportunity.

Our assumption that underlying assets of microfinance investment funds, i.e. loans to microfinance institutions or equity participations in such institutions, are not (or only marginally) exposed to global markets are backed by two special features of microfinance. Firstly, microfinance institutions implement special risk management techniques uncommon for developed credit markets in order to ensure smooth repayment of loans provided. These features include the provision short-term and small-size loans with high frequency of installments and flexible repayment schedules, the use of dynamic incentives by conditioning a new loan on full repayment of a previous one, the group-lending mechanism and focus on women customers as well as knowledgeable staff understanding rural and low income customers that instantly remain in touch with their clients and know their financial capacities. Therefore, despite the fact that microloans are provided without the collateral requirement the delinquency figures remain very low. Secondly, microfinance customers are in general small entrepreneurs who provide essential services and products to a closer community and operate in the informal economy. Their exposure to the formal domestic economy as well as international markets is therefore limited and should not have impact of their repayment behavior.

Secondly, we shall examine whether the performance of studied microfinance funds surpasses the returns generated by the above mentioned indices or whether they record at least comparable returns. Shall the two previously stated hypothesis be confirmed we may see the microfinance sector as a class of assets that is able to compete for the attention of both socially responsible investors but also commercially oriented institutional asset managers. In consequence, this move could bring more funding to the sector (and deeper down the sector), which would surely be a positive sign for developing countries.

In order to accomplish our research program we suggest to use the following simple measures of risk and return performance.

3.2 Performance Measures

3.2.1 Risk Measures

Risk of investment or a portfolio of assets can be measured in several ways and each risk measure is unique in the way risk is measured. To assess the total risk of an asset (i.e. share in a microfinance investment fund) we shall use the *standard deviation of monthly returns* where r_{it} is the observed return of an asset i for time t . This statistic measures the volatility of asset's returns and is a standard measure of risk, nevertheless is the most suitable when an asset is held alone i.e. not in a broader portfolio of assets.

And since our task is to argue whether microfinance investment funds based on the case-study evidence have (or not) a portfolio diversification value for an investor, we need to assess the risk of an asset within a broader portfolio. For that reason we shall use the historical *portfolio beta* and the *portfolio R-squared* measures that are both derived from the Capital Asset Pricing Model (CAPM). The regression analysis of the CAPM model is used in performance analysis of particular equities or mutual funds portfolios against a benchmark portfolio of risky assets that they are usually part of. Both coefficients of the CAPM, alpha and beta, have economic meaning and therefore it is useful to undertake such analysis and find their estimates. Similarly to the CAPM we shall regress the risk-free rate adjusted returns of studied microfinance investment funds against four selected market portfolios (world indices), for which it holds that neither of the MIVs was taken into account when computing the index. Put another way, our aim is not to verify whether the CAPM model holds for microfinance funds (in terms of estimated historical values of its parameters), but we will rather profit from the economic meaning of alpha and beta.

In order to estimate and interpret historical alpha and beta as well as the R-squared of studied microfinance investment funds we shall run an ordinary least squares (OLS) linear regression of a following model:

$$r_{it} - r_{ft} = \alpha_i + \beta_i(r_{Mt} - r_{ft}) + \varepsilon_t$$

where:

r_{it} = observed return on microfinance investment fund i for time t ,

r_{ft} = observed return on a risk-free asset (4-week U.S. Treasury Bill rate) for time t ,

r_{Mt} = observed return on a market portfolio M that we use as a benchmark for time t ,

ε_t = error term for time t .

The dependent variable is therefore the risk premium (or excess return) of an asset or portfolio i for time t while the excess return of the market portfolio M for time t , is the independent variable. Coefficient beta reflects the sensitivity of asset's return to returns of a market portfolio and therefore it reveals how an asset or a portfolio is correlated to the performance of a benchmark index. High beta denotes high volatility of a security, but may bring higher returns while beta smaller than one corresponds to a defensive asset whose volatility is on average lower than reference market. Beta is a measure of a systematic (or non-diversifiable) risk of an asset within a broader portfolio and in a well-diversified portfolio it creates almost all of the risk. Beta equal to zero then signifies that a given asset is not correlated to benchmark portfolio and its systematic risk is null and its addition to a broader portfolio of assets may help to reduce the overall risk of a portfolio.

The linear regression's *R-squared* gives an information about the goodness of fit of a model. And while the beta indicates the direction in which portfolio returns are correlated to those of the reference portfolio, the R-squared signifies how tightly these returns are correlated. R-squared of 10% would therefore suggests that only a one tenth of the variability in microfinance fund's returns can be attributed to the moves of the benchmark index. From the portfolio diversification point of view low R-squared may be therefore desirable to limit the exposure of a portfolio to broader financial markets.

3.2.2 Return Measures

Jensen's Alpha

Jensen's Alpha is a measure used to evaluate the portfolio manager risk-adjusted performance that stems from the above described linear regression. While the CAPM model presumes that even though a given portfolio may sometimes outperform the market, this excess return outbalances loss from some other year and in the long-term we see no positive or negative excess returns. Jensen asked whether it is possible that some securities outperform the market consistently from one year to another. Therefore he added the alpha component to the model in order to be able to test such hypothesis. Jensen's alpha therefore measures the added return of a portfolio against its theoretical expected return implied by the CAPM that compensate an investor for the symmetric risk measured by the beta. Positive alpha is therefore attractive from the investors point of view.

We shall assess the historical value of alpha by regressing the excess returns of microfinance funds' portfolios over the market's excess returns, i.e. the previously evoked linear regression $r_{it} - r_{ft} = \alpha_i + \beta_i(r_{Mt} - r_{ft}) + \varepsilon_i$.

Sharpe Ratio

The Sharpe ratio developed by William F. Sharpe (1966), is a risk-adjusted measure of portfolio's return that uses the mean and standard deviation of a *differential return*, i.e. the excess return of a portfolio over a given benchmark - originally the risk-free asset; nevertheless there has been many modifications and extensions of the ratio whether actively used in financial markets or discussed on the academic ground. The Sharpe ratio that was originally by its author called the *reward-to-variability ratio*, expresses how much the excess return compensates for the additional risk an investor assumes when holding a riskier asset. Since the Sharpe ratio does not take into account the correlation of a given investment with other assets in an investor's portfolio, it does not adjust for the systematic (*undiversifiable*) risk, but rather measures portfolio performance with regard to the total risk measured by the portfolio standard deviation of returns. The desirable level of Sharpe ratio has not been fixed up and it is rather used to compare mutual funds performance as a fund with a higher Sharpe ratio seems to be more attractive from the perspective of its risk/return profile.

In our analysis we shall use the ex-post Sharpe ratio that uses historical data in order to come up with a performance measure that will be used in an investment decision-making for the future. Therefore, implicitly or explicitly, it is assumed that historic results have at least some predictive ability (Sharpe, 1994). The ex-post Sharpe ratio of a portfolio p is calculated by dividing the historic mean value of the differential return of a portfolio over the period T by the standard deviation of the *differential return* over the same time interval.

Treynor Ratio

The Treynor ratio developed by Jack L. Treynor (1965) is alongside with the Jensen's alpha another performance measure derived from the capital asset pricing model. The ratio is sometimes called also the *reward-to-volatility ratio* as it measures the *portfolio performance (excess return) with respect to portfolio's* systematic risk exposure. Equally, it applies that the higher the Treynor ratio the better investment's returns adjusted for systematic risk.

The Treynor measure is very sensitive to the beta in denominator and according to Hubner (2005) it may provide unstable and imprecise performance measures for market

neutral funds because of the risk of measurement error. For funds with negative betas, the Treynor Ratio is, in effect, inapplicable as it attributes a negative performance to funds with positive abnormal returns (Hubner, 2005). On that account Hubner (2005) argues that when the beta (systematic risk of funds) is close to zero the Jensen's alpha is a suitable symmetric risk-adjusted performance metric. We shall keep this in mind when assessing our microfinance investment funds.

The research program outlined in this paper was conducted in the framework of Czech Science Foundation, grants 402/09/0380, 403/10/1235 and the research project MSM0021620841. The extensive econometric analysis based on the performance measures presented in this chapter is a subject of a special dedicated working paper Janda and Svarovska (2009).

References:

Bauer, M., Chytilová, J. & Morduch J. (2008). *Behavioral Foundations of Microcredit: Experimental and Survey, Evidence From Rural India*. Prague: Charles University in Prague, Faculty of Social Sciences, Institute of Economic Studies, 2008.

Christen, R.P., Rosenberg, R. & Jayadeva, V. (2004). *Financial Institutions with a “Double Bottom Line”: Implications for the Future of Microfinance*, Washington: CGAP, Occasional Paper No. 8, July 2004. Available at: <http://www.cgap.org/p/site/c/template.rc/1.9.2701> (accessed May 11th 2009).

Cull, R., Demirgüç-Kunt, A. & Morduch, J. (2008). *Microfinance meets the market*. World Bank Policy Research Working Paper No. 4630. Available at: <http://econ.worldbank.org> (accessed April 25th 2009).

Dokulilova, L., Janda, K. & Zetek, P. (2009). *Sustainability of Microfinance Institutions in Financial Crisis*. MPRA Paper 17696.

Galema, R., Lensink, R. & Spierdijk, L. (2008). *International Diversification and Microfinance*. Netherlands: University of Groningen, working paper series. Available at SSRN: <http://ssrn.com/abstract=1286769> (accessed April 25th 2009).

Gonzalez, A. (2007). *Resilience of Microfinance Institutions to National Macroeconomic Events: An Econometric Analysis of MFI Asset Quality*. Microfinance Information Exchange, Inc., Discussion Paper No. 1, July 2007. Available at: <http://mpira.ub.uni-muenchen.de/4317> (accessed May 11th 2009).

Hubner, G. (2005). *The Generalized Treynor Ratio*. Review of Finance, Vol. 9, pp. 415-435, 2005. Available at: <http://ssrn.com/abstract=780245> (accessed May 11th 2009).

Janda, K. and Svarovska, B (2009). *Investing into Microfinance Investment Funds*. IES Working Paper, Institute of Economic Studies, Faculty of Social Sciences, Charles

University, Prague. Forthcoming 2009.

Krauss, N. A. & Walter, I. (2008). *Can Microfinance Reduce Portfolio Volatility?* NYU Working Paper No. FIN-06-034. Available at: <http://ssrn.com/abstract=1300771> (accessed April 25th 2009).

Sharpe, W. F. (1994). *The Sharpe Ratio*. *Journal of Portfolio Management*, Fall 1994, pp. 49-58.

Sharpe, William F (1966). "Mutual Fund Performance." *Journal of Business*, January 1966, pp. 119-138.

Treynor, Jack L (1965). „How to rate management of investment funds.“ *Harvard Business Review*, 1965.