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Portfolio Approach and the Secondary Market for Developing Country Debt

1. Introduction

There is a renewed interest among banks in transferring the principles of modern portfolio theory to bank lending. The buzz words are RORAC and RAROC, i.e return on risk-adjusted capital and risk-adjusted return on capital. This interest originated with the new capital adequacy guidelines of the Bank for International Settlements while the theoretical foundations are provided by portfolio theory. Apart from its theoretical appeal, portfolio theory also offers an operational definition of risk, namely, the volatility of returns over time. Unfortunately, this definition implies that assets must be marked-to-market which is typically not the case in bank lending. However, there are exceptions, one of them being the market for developing country debt. Thanks to the creation of this market, systematic marking-to-market of loans has now become possible, so that existing loan portfolios can be placed in the risk/return framework and optimal portfolios can be estimated. The purpose of this paper is twofold. First, to situate the loan portfolios of international banks in the risk/return framework and second, to discuss diversified strategies for an improvement. Our evidence suggests that loan portfolios dating from the time of the international debt crisis are positioned suboptimally from the standpoint of modern portfolio theory. In fact, the naive diversification strategy of equal asset distribution outperforms the loan portfolios of the international banks. In a world in which capital is becoming more and more expensive and competition between banks increasingly fierce this is a surprising result. It can be explained by the fact that loans to problem countries were immobilized over a long period of time and even today regulatory and tax considerations make it difficult to actively manage the loans. Another important explanation for the suboptimal position of loan portfolios is that lending officers seem to ignore the mean-variance framework of valuation. Actually, mean-variance optimization does not necessarily generate loan portfolios which comply with the principles of prudent banking. However, this article shows that mean-variance optimization coupled with financially meaningful constraints offer the best of both worlds.

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2. The secondary market for debt and previous research

The emergence of the secondary market for developing country debt originated in the international debt crisis, which started with Mexico's debt moratorium in August 1982 and quickly spread to other

major developing countries. Once it became clear that the debt crisis was not of a short-term nature, banks - which were at this time the major creditors - started to swap the loans among each other in order to eliminate unwanted concentrations in their portfolios or to exploit tax considerations. This was the birth of the secondary market for developing country debt. The new market typically expressed the value of a given country loan as a percentage of face value and quoted it in cents on the dollar, e.g. 65 cents.

Initially the market developed rather slowly largely because the numerous syndicated bank loans were not standardised. But that changed after 1985 when major developing countries (Chile 1985, Mexico 1986, the Philippines 1986, Ecuador 1987, Venezuela 1987 Brazil 1987 and Argentina 1987) adopted formal debt conversion programs. These opened the way for investors who wanted to purchase dollar-denominated debt on the secondary market and convert it into local currency for an equity investment. As a side-effect of these programs and of repeated debt reschedulings, individual country loans were restructured and homogenized which among other things facilitated the rise of the secondary market. The total volume of loans traded grew from around US$ 6 billion in 1985 to an estimated US$ 100 billions in 1990 and to US$ 200 billions in 1991.

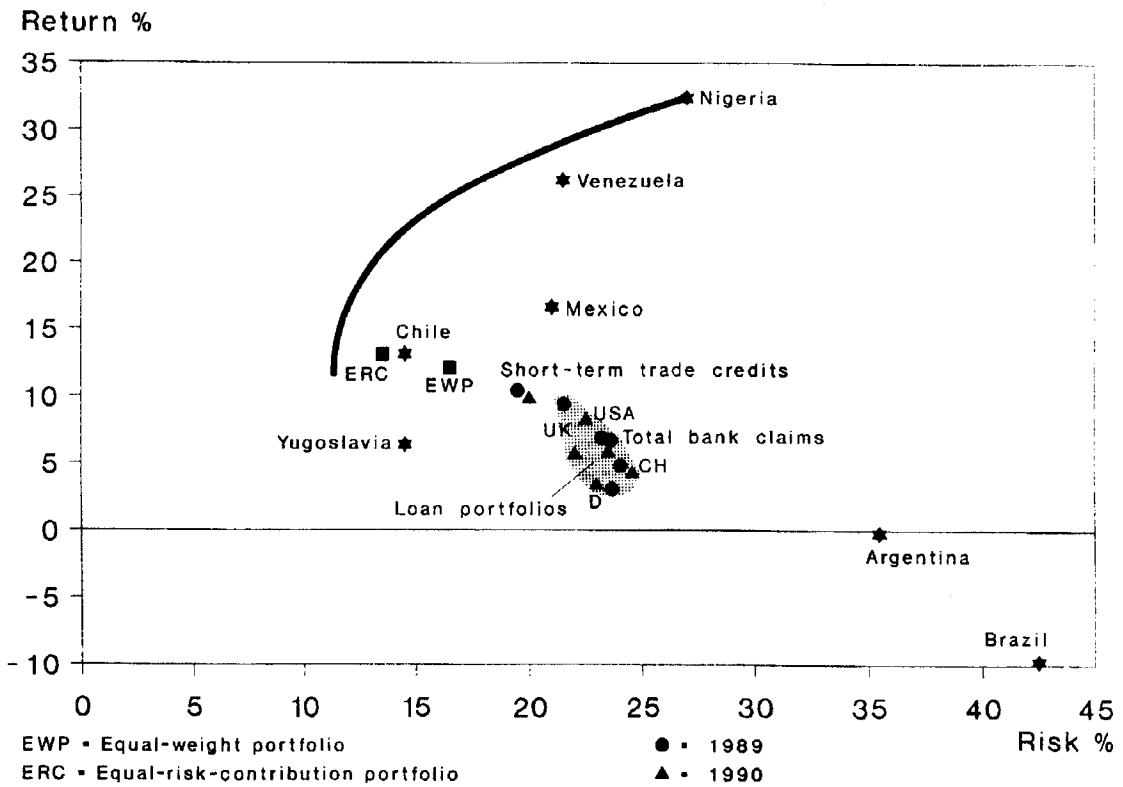
Empirical studies of the secondary market focused mainly on the determinants of prices and market returns. It is not surprising that the findings of these studies depend to a large extent on the specific questions posed and procedures used. If the question is asked whether insolvency or illiquidity considerations drives the prices, the answer is that it is economic insolvency [1]. Using time series analysis, the work of STONE (1991 a and b) points in the same direction. He found a surprising insensitivity of secondary market prices to standard financial market news while country-specific factors and non-quantifiable risk considerations explained a great deal of price variations. In contrast a cross section analysis by COHEN/PORTES (1990) showed that prices were driven primarily by a set of common factors including interest rates. Such conflicting findings present a puzzle.

To some extent DEMIRORS/JOHNSON (1992) addressed this problem, arguing that price adjustment delays are present in the secondary market and therefore should be explicitly taken into account. Otherwise models are misspecified. In fact after incorporating the economic effects of price-adjustment delays in their model, the authors conclude that "both the explanatory power of an estimated multi-beta CAPM and the statistical significance of additional factors and events are improved significantly" [2]. It therefore seems that secondary market prices reflect not just idiosyncratic factors but also world market or common factors and event factors. This view is further supported by the somewhat different approach of SALEMI (1991) who asked whether developing country risk can be diversified. He tested the out-of-sample performance of the Markowitz minimum-variance portfolio against an equal-weight portfolio. If secondary market returns were predominantly driven by idiosyncratic factors of equal variance, the equal-weight portfolio should outperform the minimum-variance portfolio. It turns out that is not the case and SALEMI (1992) concludes that the correlation structure is sufficiently stable "that one may reasonably use sample information and standard portfolio theory to construct a diversified portfolio of sovereign bonds" [3]. That is the starting point of this paper. As long as one can assume that the variance covariance structure of returns changes sufficiently little over time, standard portfolio theory may be employed for strategic asset allocations. A natural first question is to ask where the loan portfolios of international banks are located in the risk/return framework and then to address the second questions of whether there are possibilities to improve the diversificaton. As pointed out in the introduction, this paper deals with both questions.

3. Risk/return positioning of LDC credit portfolios

Normally, it is not possible to transfer modern portfolio theory to loan portfolios directly. Unlike securities, credits are not marked-to-market. Consequently, risks and returns cannot be measured with the rate of price changes and its volatility as is the case in the securities sector. Of course, all of this changes as soon as there is a secondary market for loans. With market returns available, optimal loan portfolios (i.e. mean-variance optimization) similar to those in the capital market sector can be calculated. A concrete example appears in Figure 1. It shows the common risk/return area for a loan portfolio consisting of 7 debtor countries. The stars show where each of the debtor nations stood in terms of both the return and risk dimensions during 1989 and 1990. In line with the definition of stock returns, we define returns as the percentage price change of the debt traded in the secondary market. The risk results from the volatility of returns over time and is measured by its standard deviation [4]. For example, Brazil's risk is measured by an annual standard deviation of 42.6% and the annual return by -9.8% [5]. In contrast, Chile yields a much more favourable risk/return combination, i.e. a standard deviation of 14.3% and a return of 13.1%. The curve represents the optimal risk/return combination of mixed country portfolios. Along this curve it is not possible to enhance returns by shifts in the portfolio without simultaneously increasing the level of risk. If investors want to earn high returns, they have to pay with a higher level of risk. On the other

Figure 1: Return/Risk Monitor.



Data: Salomon Brothers; Federal Financial Institutions Examination Council (various issues); Deutsche Bundesbank (verschiedene Ausgaben); Bank for International Settlements and OECD (various issues); Schweizerische Nationalbank (1989 und 1990); Bank of England (various issues).

hand, investors reluctant to take on risks have to be satisfied with lower returns. This curve is also known as the so-called efficient frontier [6].

It is interesting to note where on graph 1 the loan portfolios of the international banks stand in terms of risk and return. The shaded area far below the efficiency curve indicates their location. The banks in Switzerland, Germany, the United States and the United Kingdom all held sub-optimal loan portfolios in 1989 and 1990 [7]. In particular the loan portfolios of Germany and Switzerland were less well structured. It is, however, necessary to distinguish between the structure of a portfolio and the overall exposure. It is well-known that Swiss and German banks had a substantially lower LDC loan exposure than Anglo-Saxon banks but due to their proportionally higher commitments in Brazil and Argentine their loan portfolios were less efficiently structured. By restructuring their portfolios, international banks could have earned a return of 25% to 30% without having to accept a greater portfolio risk. Instead, returns on the loan portfolios were only 5% to 10%. This example shows how important the transfer of modern portfolio theory can be for managing the loan portfolios of debtor nations. The loan portfolios of the international banks deviate sharply from the efficient frontier largely due to the fact that after the outbreak of the international debt crisis, loans were immobilized for a long time and it was not possible to actively manage them. It is also interesting but not too surprising to note that the loan portfolios of the international banks are structured quite similarly. This supports the well-known hypothesis that banks in the 1970's showed a substantial amount of parallel behavior in their lending practices towards the developing countries. This so-called herd instinct of banks was promoted in the 1970's through the widespread use of the syndication technique, which tempted smaller banks in particular to follow large banks. Moreover the second oil price shock in 1979 reinforced the parallel behavior syndrome. Politicians and the press at the time pressured the commercial banks into involving themselves more in petrodollar recycling which then led to the mistaken assumption among the banks that in case of default they would be bailed out by their governments [8].

Of course, the hypothesis of parallel behavior is only part of the picture and applies only to the old immobilized loans. Since short-term credits were exempted from debt reschedulings and subject to voluntary lendings, they should exhibit a more satisfactory risk/reward trade-off than long-term credits. In fact, as shown in Figure 1, the portfolio of short-term trade credits outperforms that of the corresponding total aggregate which includes both short-term and long-term credits [9]. For example, in 1990 the trade-related portfolio was valued with a return of 9.7% and a standard deviation of 20.1% as compared to 5.8% and 23.6% for the overall portfolio. Although this result moves in the direction we would expect, the trade-related portfolio still lies far below the efficiency curve. Two explanations come to mind. The valuation of short-term trade financing using secondary market prices for developing country debt is not correct. That possibility cannot be entirely excluded since the current spreads from trade financing are not taken into account in the valuation. The other explanation is that loan portfolio managers simply ignore the valuation of credits in terms of the mean-variance framework. It is true that loan portfolios at banks are not managed like securities portfolios. Even the concept of risk in the securities and lending industries is different. In the lending business, risk is measured according to the creditworthiness of the borrower. This is ultimately a qualitative assessment and may not correspond to volatility of returns. As a result, it is very likely that the lending portfolios are not efficient in the sense of the mean-variance framework.

4. Diversification strategies

Thanks to the secondary market for developing country debt, we are not only able to value existing portfolios but can also suggest "optimal" investment policies. In this context it is, however, important to realize that the Markowitz mean-variance optimization which we used to construct the effi-

cienct frontier in Figure 1 is not synonymous with a financially sound diversification. This is well-known in practice. For example, the optimal asset allocation in Table 1 shows that 3 of the 7 debtor countries in the minimum-variance portfolio (MVP) are immediately eliminated, and in the upper branch of the efficient frontier only risky Nigeria remains. Moreover, as argued by JORION (1985) and by MICHAUD (1989), the mean-variance model tends to give excessive weight to investments with high expected earnings while those with low expected returns are underweighted. The overall results, therefore, may be severely distorted, especially since the input into the model is based on forecasts for expected risks and returns. These are inevitably subject to serious forecast errors which may be multiplied by optimization.

In practice, these problems can be solved by restricting the scope for mean-variance optimization, for example by setting upper investment limits. The effects of two restrictions on the 7-country portfolio are presented in Figure 1. First, we have assumed that the exposure in each country should be the same size. This kind of naive diversification applies when on average the risk/return combination of every investment is nearly the same or the country-specific risks dominate. Since in reality this is not the case, the risk/return combination of the equal-weight portfolio (EWP in Figure 1) falls far below the efficiency curve. Nevertheless, it is worth noting that this portfolio is considerably better than the actual loan portfolios of the international banks, including the portfolio for short-term trade credits.

Another diversification strategy is to limit the risk contribution of each country in the total portfolio. In this way, all of the countries in the portfolio can be taken into account (wide diversification) while at the same time high-risk countries can be kept from exerting undue influence. We have applied a special type of this strategy, namely equal-risk contribution (ERC), to our 7-country portfolio. The ERC portfolio indicates the corresponding risk/return combination. Although the return (13.1%) is only slightly higher than for the portfolio with an equal-weight distribution of exposure, the risk is, as expected, much lower. Table 2 indicates the com-

Table 1: Efficient portfolios and optimal asset allocation.

Portfolio	MPV				
Portfolio Return %	11.9	17.1	22.2	27.3	32.4
Portfolio Risk %	10.9	12.1	14.5	17.8	27.0
Argentina %	0.0	0.0	0.0	0.0	0.0
Brazil %	0.4	0.0	0.0	0.0	0.0
Chile %	41.8	39.8	33.3	11.4	0.0
Mexico %	10.0	12.7	4.6	0.0	0.0
Nigeria %	7.0	21.3	30.1	41.6	99.8
Venezuela %	0.0	6.0	26.5	47.0	0.2
Yugoslavia %	40.8	20.2	5.5	0.0	0.0
Total %	100.0	100.0	100.0	100.0	100.0

MPV is the minimum variance portfolio. The numbers in the lower part of the table indicate the composition of optimum portfolios.

Data: See Figure 1.

position of this portfolio. In contrast to the narrow diversification along the efficiency curve (Table 1) the ERC portfolio is broadly diversified. The influence of the high-risk countries has been reduced while the influence of the less risky countries has been increased. As a result risk and exposure are inversely related although not perfectly because the influence of the covariance is taken into account [10]. The ERC portfolio shows how the imposition of financially meaningful constraints in combination with mean variance optimization generates satisfactory results which are appealing both from the standpoint of prudent banking and of risk/reward considerations.

Thanks to its wide dispersion of risks, the portfolio with equal-risk contribution is an useful investment strategy if the portfolio were to be held over the medium or long term. At the same time, it is a reasonable exit strategy. Assuming that a bank intends to dissolve a country's portfolio, it would

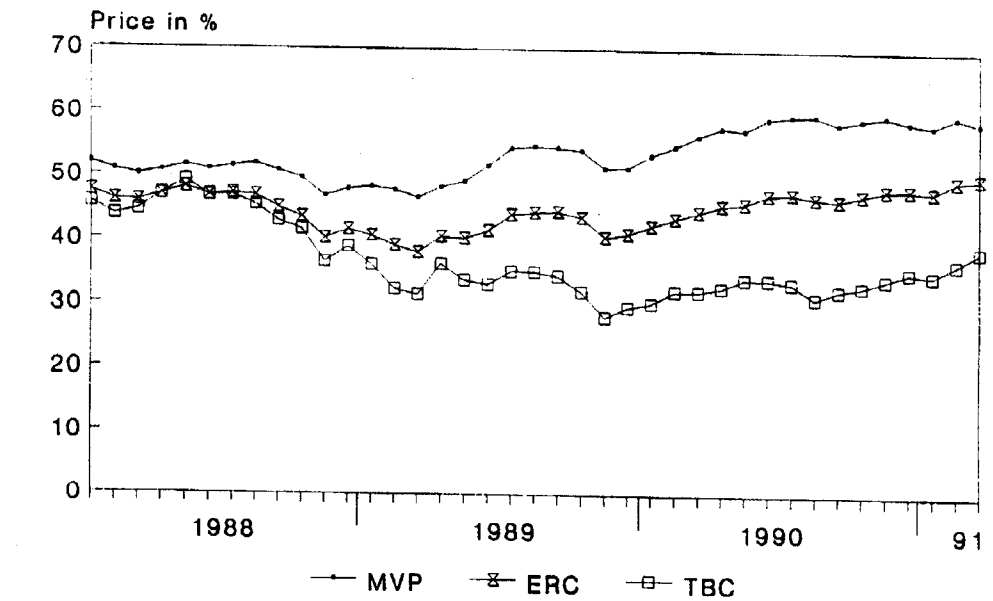
Table 2: Equal-risk-contribution portfolio.

	Exposure[1]	Risk[2]
	in %	in %
Brazil	8.0	42.6
Argentina	8.0	35.6
Nigeria	14.0	27.1
Venezuela	10.5	21.7
Mexiko	12.5	20.9
Yugoslavia	24.0	14.4
Chile	23.0	14.3
Total	100.0	

[1] Optimum portfolio composition conditional on the risk contribution of each debtor country beeing equal (14%).
[2] Risk ist the annualized standard deviation of returns.

Data: See Figure 1.

Figure 2: Price Performance.



MVP = Minimum-variance portfolio
ERC = Equal-risk-contribution portfolio
TBC = Portfolio of total bank claims '90

Data: See Figure 1.

first try to gradually approximate the ERC portfolio by selectively selling off the debt. Next, it would continue selling off the portfolio according to the weighting.

Finally, in order to give an idea of how the different strategies work over time, the price performance of the minimum-variance portfolio (MVP), of the equal-risk-contribution portfolio and of the portfolio of total bank claims (TBC) was calculated. There were no surprises. As Figure 2 illustrates, there is a systematic price difference between the three investment strategies. The more risky unconstrained minimum-variance portfolio performs best. At the end of 1990, it achieved a price of 58%, followed by the ERC strategy with a price of 50%. The immobilised portfolio of total bank claims (TBC) achieved a price of about 38% at this time.

5. Conclusions

We have estimated the efficient frontier for a 7-country portfolio and discussed alternative investment strategies. One important conclusion is that the loan portfolios of the international banks are poorly diversified. Even naive diversification with exposures of equal amounts shows a better risk/return performance than the banks' actual loan portfolios. How can that be? The main reason is that these LDC loans were immobilized over a long period of time and it has only recently become possible to actively manage them. At present, however, such management is still constrained by tax considerations and aggregate provisioning of the banks. For example, in Switzerland, the Swiss Federal Banking Commission imposes a flat provisioning rate of 65% on loans to a basket of problem countries. No attempt is made to differentiate between various country risks. If a bank wishes to upgrade its portfolio and swaps low priced assets for high valued assets, it must allocate additional funds to its country provisionings, since the write-off on the sold asset might use the total existing provisions, leaving no or few provisions for the purchased assets. In addition, these highly valued assets would need further provisions to reach the required 65%. Analogously, the downgrading of the portfolio leads to surplus provisions. Consequently, there is little incentive for banks to improve their country portfolios by reallocations. On the contrary, since for comparatively good assets the provisioning rate is the same as for very risky ones, there is more of an incentive to shift to riskier portfolios [11]. Second, loan portfolios at banks are not managed in the same way as securities portfolios. Since once a loan is concluded it is not continuously reevaluated by the market, the lender usually does not know where the efficient frontier lies. Hence, the effects of a new loan on the existing portfolio cannot be evaluated. It is quite possible that the total of individual credit decisions, which are frequently made in different divisions at the front, may generate a loan portfolio which is distinctly suboptimal overall. That only becomes clear once debt problems arise and/or credits for the capital market are syndicated. Finally, our results should be viewed with a certain amount of caution. The 7-country portfolio is only a partial portfolio, a global solution may show a much better diversification.

The other important conclusion of our study is that even passive diversification strategies would significantly improve the loan portfolio. As an example, we emphasized that the equal-risk-contribution portfolio is an interesting strategy which combines the need for prudent banking with risk/reward considerations.

Footnotes

[1] BOEHMER/MEGGINSON (1990).
[2] DEMIRORS/JOHNSON (1992), Abstract.
[3] SALEMI (1992), p. 4.
[4] The returns used in this analysis are defined as annualized month-over-month changes in the average of bid and ask price quotations. The bid and ask prices are from Salomon Brothers and cover the period of March 1986 to February 1991 (Salomon Brothers, Indicative Prices for Less Developed Country Bank Loans; The price series used in this study are available on request from the author or can be obtained direct from Salomon Brothers). Quotes were chosen as near as possible to the mid point of each month.
[5] It may be objected that assets with expected negative returns will not be included in a portfolio. This is in general correct but in our case loans are considered which had for some time been immobilized.
[6] The efficient frontier was estimated using as risk horizon the total period between March 1986 to February 1991 and as return horizon the period January 1989 to February 1991. The sample period for the variance and covariance matrix which extends further back in time is based on the usual considerations that risks and the correlation structure of risks should be more or less stable over time. Assuming that this is the case, one would like to have an adequately large sample period in order to generate a robust and an informative set of variance and covariance coefficients. By contrast, for the calculation of the returns the shorter time horizon was chosen as in this case the past is less of a guide for the future. Be that as it may, it can be added that the basic results of this paper hold also if the returns are calculated over the whole period.For a detailed explanation of the mean-variance concept of portfolio analysis see ELTON/GRUBER (1987) and for a more general introduction HERI (1991).
[7] The loan portfolios are calculated from the exposure that each national banking system has vis-a-vis the 7 debtor countries. The sources are national bank statistics.
[8] There is a whole literature on the so-called herd instinct of banks. See for example GOODMAN (1983), GUTTENTAG/HERRING (1983) and NUNNENKAMP/JUNGE (1985).
[9] Short-term trade credits are trade-related bank claims under official insurance or guarantee and are reported to the OECD. Total bank claims represent the aggregate of all bank claims reported to the BIS and the OECD.
[10] For further discussions of the equal-risk-contribution portfolio see LÖRTSCHER (1990) and KESSLER/SCHWARZ (1992).
[11] I should like to thank my colleague, M. Hoppe, for having drawn my attention to this point.

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