A RESOURCE ALLOCATION MODEL FOR THE SME QUARTERLY
INVESTMENT DECISIONS BY THE INTERNATIONAL FINANCE CORPORATION

A GROUP PROJECT REPORT SUBMITTED TO
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IN PART FULFILLMENT OF THE REQUIREMENTS FOR THE

EXECUTIVE DECISION MAKING COURSE
MGT. 224

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FALL 2000

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Abstract

The mission of the International Finance Corporation (IFC), part of the World Bank Group, is to promote private sector investment in developing countries, which will reduce poverty and improve people's lives. The IFC mobilizes its capital in the international financial markets.

The IFC receives and evaluates business finance applications on an ongoing basis. The Operations Secretariat was interviewed to determine which alternative Small Medium Enterprises (SMEs) finance applications are being considered for investment in the developing world for the upcoming quarter. The investment portfolio under consideration amounts to $49,9 million against a budget of $40 million for the sector worldwide. The decision to finance (or not to finance) a transaction is currently based on whether or not the transaction meets the IFC internal operating principles, and on a first-come- first-served basis subject to the availability of fund. Due to the budget constraint and the unstructured process, tensions always rise when the decisions are made.

The Secretariat officials agreed that the current process is not structured enough. The methodology proposed herein and the Expert Choice model used would aid the IFC in structuring and synthesizing the allocation of its limited resources towards financing a typical portfolio of seven packaged deals. These packaged deals are evaluated on the basis of eight objectives derived from the IFC operational principles, including: investment risk, investment return, impact on the private sector growth, management experience, non financial development factors and IFCs operational principles.

Introduction

The mission of the International Finance Corporation (IFC), part of the World Bank Group, is to promote private sector investment in developing countries, which will reduce poverty and improve people's lives. The IFC finances private sector projects in the developing world, mobilizes capital in the international financial markets, and provides technical assistance and advice to governments and businesses. The IFC has in its pipeline at any point-in-time more project applications than the available capital to finance them.

The operations secretariat was interviewed to determine which projects were contemplated for funding in the upcoming quarter. A list of all seven SME projects was compiled from the project database. The total cost of these projects amounted to $49,919 million against a quarterly budget of $40 million for the SME sector worldwide. The budget constraint has always been a source of tension between investment officers and regional directors. This is particularly true, as the more or less '*BOGSAT*' (**B**unch of **O**ld **G**uys/Gals **S**itting **A**round **T**alking) method is used to decide, instead of a formal process of decision making. In discussions with the Secretariat, it was established that a set of guidelines, based on the IFC operational principles, forms the basis for investment committee's discussions and prioritization of investments. These guidelines were reformulated as objectives for the purposes of using a structured resource allocation methodology.

Problem Statement

The current process of allocating resources at the IFC is an organized process that requires that (1) comprehensive information be gathered, (ii) detailed analysis of the information be done and presented to a decision meeting, and (iii) a director chairs such meetings. Seven or more projects, with varied attributes and motivations, are compared and considered at such meetings.

The observed limitations of this process do not lie in the gathering and the analysis of information, but in the design of the decision making. For example;

- The meetings are dominated by the chairperson or a few vocal and articulate individuals, and are not facilitated;
- The discussions typically involve seven or more projects, in as many countries, over as many sectors, with varying amounts and different funding instruments1.

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[1] According to 'Ernest Forman, Decision by Objectives, book manuscript to be published. Page 6'; "The human brain's ability, and indeed that of the participants, to discriminate between these factors all at the same time is limited. Such cognitive limitations reduce the quality of the decisions at such

- The meeting time normally runs out. Towards the end, the proceedings boil down to 'nutshell' briefings or the incremental change processes of sticking closely to the last decision bearing on the issue.
- Frustration develops in these meetings as some points are discussed several times while other important points are not discussed at all.

All the above listed limitations of the so-called 'BOGSAT' decision making process often do not lead to a rational decision. Bad investment projects may be funded ahead of better ones, resulting in obvious frustration of investment officers.

Project Goal

The purpose of this student exercise was to:

- Introduce the Analytic Hierarchy Process (AHP) methodology for making resource allocation decisions, to the IFC;
- Apply the methodology and its tools to a real life IFC quarterly process of allocating limited SME resources to an unlimited demand for such funds;
- To learn lessons, both quantitative and qualitative, from the experience by comparing the results of the methodology to the hitherto used IFC decision making process.

Methodology

The Analytic Hierarchy Process (AHP) allows decision-makers to model a complex problem in a hierarchical structure showing the relationships of the goal, objectives (criteria), sub-objectives, and alternatives. AHP focuses on the achievement of objectives. AHP allows for the application of data, experience, insight, and intuition in a logical and thorough way. It enables the decision-makers to derive ratio scale priorities or weights for the objectives with respect to the goal, and for the alternatives with respect to the covering objectives, as opposed to arbitrarily assigning such weights. Its use facilitates the:

(a) structuring of complexity that is encountered when dealing with multiple objectives, such as the case in point here;
(b) the measuring of judgements about which objectives are more important than others and about preferences for alternative investments; and
(c) measuring how well each alternative contributes to each of the lowest level sub-objectives; and

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meetings. It is therefore argued that decision making for every complex, crucial decision takes place under constraints of human information-processing limitations".

(d) Finding the best combination of alternatives, subject to environmental and organizational constraints.

The Expert Choice software was used to implement AHP. Expert Choice is a software that automates the AHP methodology and allows the user to structure the decision making process.

The Investment Alternatives Section immediately below details the investment alternatives that the limited resources must be allocated to. Following the Alternatives Section is the description of the identified objectives, and an illustration of how their relative weights were derived. The measurement of how well each alternative contributes to the objectives will then be presented. Last but not least, is a discussion of how the model uses the objectives and alternatives information presented to facilitate a rational allocation of the resources. Conclusions are then drawn.

The Investment Alternatives

Detailed below are seven investment projects that will be presented to the Investment Committee of the IFC at the beginning of December 2000, and to which the AHP and Expert Choice methodology was applied.

INDIA: RUPEE LOANS TO SMALL AND MEDIUM ENTERPRISES (SMEs)

The IFC and India's Global Trust Bank (GTB) are considering collaborating on a new initiative that will mark a milestone for IFC operations in India by establishing a US$40 million facility to provide Indian rupee, as well as U.S. dollar loans, to the SME sector in India. Indian SMEs have limited access to long-term project finance, especially if they require local currency funding. IFC is asked to contribute $10 million to the syndication.

The facility will enable IFC to fund many small businesses previously beyond its reach. SME businesses will be able to access loans in either Indian rupees or U.S. dollars, depending on their needs.

GTB was formed in 1994 as a new generation private sector bank strongly focused on serving the Indian SME sector. It's superior technology and customer service has made it one of the faster growing banks in the country. GTB was also one of the first Indian banks to produce and follow a stringent corporate governance code. GTB officials expect that the new facility with its provision of local currency financing would strengthen Indian SMEs, which had experienced excellent growth in recent years.

The government of Netherlands provided technical assistance to support a study to improve GTB's credit approval system.

CENTRAL AND EASTERN EUROPE (CEE): GROWTH FUND TO MAKE EQUITY INVESTMENTS IN SMEs

IFC together with Germany's Deutsche Investitions-und Entwicklungsgesellschaft mbH (DEG), the State Secretariat for Economic Cooperation of Switzerland (SECO), the Finnish Fund for Industrial Cooperation (FFIC), Evangelische Kirche in Hessen und Nassau, and Calvert World Values International Equity Fund, are considering establishing the Small Enterprise Assistance Funds (SEAF) CEE Growth Fund LLC. The fund will make equity investments in SMEs, mainly with existing SEAF country fund clients, who have outgrown the investment range of SEAF country funds or have established a viable track record and are ready to expand their operations.

SEAF Management LLC, a Washington DC based non-profit group that employs a team of seasoned professionals who focus exclusively on private equity investments, will manage the fund. The fund manager operates small equity funds on a largely commercial basis, while using donor funds to provide extensive training, management support, and technical assistance to its investee companies. Since 1989, the fund manager has established equity funds in 10 countries in CEE and Latin America.

The fund has a target size of $30 million, of which the IFC is asked to finance $8 million.

BALKANS: TRANS-BALKAN FUND TO SUPPORT SMEs

IFC, along with several U.S. and European-based development finance institutions, is asked to establish the SEAF Trans-Balkan Fund LLC, a regional fund designed to make equity and quasi-equity investments in private SMEs in the Balkan region. Participation in the fund will form part of IFC's response to the post-crisis Balkans where IFC seeks to mobilize long-term equity capital and support an emerging private sector.

The fund will be capitalized at $24.1 million ($6 million from the IFC) and will target investments in Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYR of Macedonia, and Romania. SEAF Management LLC will manage the Fund.

Other investors will include the U.S. Agency for International Development, Norfund of Norway, the regionally based Black Sea Trade and Development Bank, DEG, SECO, and FFIC. In addition, the fund has received important

commitments and pledges for technical assistance, which will support the growth and long-term development of investee companies.

The fund will work closely with the Balkan Enterprise Facility, an IFC-managed initiative to identify investment opportunities and provide business support to the fund's investee companies. It is believed that the fund will provide direct finance to growth-oriented local enterprises and would represent a major effort to address the lack of risk capital for early stage enterprises in the region.

TURKEY: AGRO-INDUSTRY PROJECT

IFC is asked to invest $25 million (including a loan of $20 million and equity of $5 million) in Banvit Bandirma Vitaminli Yem Sanayi Anonim Sirketi (Banvit), a poultry company in Turkey. The project covers a two year $78.4 million expansion program by Banvit to increase its chicken processing capacity from 58.8 thousand to about 120 thousand tons per annum and establish a turkey processing facility with a capacity of about 28 thousand tons per annum. The modernization will enable Banvit to better serve the needs of Turkish consumers by improving the range and quality of its products.

The project would have a strong developmental impact on the local economy, as it would expand the company's network of outgrower farms from 500 to 800, creating additional rural employment as well as 300 jobs in processing plants. By supporting Banvit's expansion, IFC will help promote higher efficiency, better quality, improved sanitary standards, and best practices throughout the Turkish poultry industry.

The founder and CEO of Banvit, said the project would increase the company's competitiveness and help to prepare it for the challenges of operating in a global market when Turkey's agricultural sector is liberalized.

GHANA: FINANCING FOR COMPUTER TRAINING SCHOOL

IFC is asked to provide a loan of $230,000 to establish the NIIT Computer Training School in Accra, Ghana under a franchise arrangement with India's National Institute of Information Technology Limited, the largest Indian provider of computer education and training whose educational concepts have been replicated in many parts of the world. The school will offer courses in basic computer skills, network-centered computing, systems analysis, and programming. The total project is estimated to cost $508,000.

The sponsors are two brothers, who own the company equally and have more than 15 years experience in international trade and manufacturing in Africa and other parts of the world.

Demand for postgraduate courses in computer science is very high in Ghana as employers have made computer literacy a key criterion in their selection process for prospective job seekers.

CAMEROON: BILINGUAL EDUCATION COMPLEX

IFC is asked to provide a loan of $338,000 in Euros to Horizon Bilingual Education Complex (HOBEC)--a private bilingual (English and French) school in Cameroon—to expand its existing complex and increase student enrollment.

Hobec started operations in 1991 with two nurseries and one primary class. It offers modern and practical education to students from nursery to secondary school. The proposed expansion will cost about $676,000.

The main sponsor is an English speaking Cameroonian who was educated at the universities of Yaounde, Cameroon and Ibadan, Nigeria. She has pioneered provision of high quality bilingual education in Cameroon.

UGANDA: FINANCING FOR PRIMARY SCHOOL

IFC is considering a loan of $351,000 to establish the $1.25 million Kabojja Junior School, a co-educational private primary school in Kampala. The school will cater to 640-day scholars with a comprehensive curriculum leading to the Uganda Primary Leaving Certificate of Education. The project will also set up a bursary fund for underprivileged children from rural and slum areas. The primary school will act as a feeder to Kabojja Secondary School, which is also owned by the sponsors.

Two Ugandan nationals equally own Kabojja Junior School. One of them is a qualified teacher and part-time lecturer and the other has worked in local banks. Both are on the board of governors of several schools in Uganda. An expatriate with experience in running schools in the U.K. and Pakistan will provide technical support with assistance from locally recruited staff.

It is anticipated that the IFC's involvement would increase involvement of the private sector in social infrastructure and free up limited public resources for other priorities.

Investment Objectives

Description of Objectives

With due consideration of the mission and its supporting operational principles, all objectives used in the model represent factors that the IFC considers critical in deciding on which investments to fund. The objectives that were agreed upon with the Operations Secretariat officials. The agreed upon objectives are listed and discussed in some detail below.

1) Investment Return
2) IFC Catalytic Role
    2.1 Involvement of Other DFIs
    2.2 Client Access to Alternative Finance
    2.3 Deal Deepens IFC Reach to Clients
3) Investment Risk
    3.1 Ease of Exit
    3.2 Greenfield/Brownfield
4) Entrepreneurial / Management
    3.1 Management Experience
    3.2 Sponsor Support
5) Direct Non-Financial Impact
6) Use of IFC Preferred Instruments

These objectives are briefly described below.

Investment Return

According to the business principle (one the operational principles), the IFC should function like a business in partnership with the private sector and take the same commercial risks, so that its funds even though they are backed by public sources, are transferred under market principles. The project investment returns are positively correlated, in a concave line relationship, to the IFC investment preferences.

IFC Catalytic Role.

This is one of the operational principles, saying that the IFC should seek to create opportunities for it, the private investors and markets to make good investments in developing countries (third *sub-objective*). The corollary is that, the IFC must open up new funding opportunities for its *clients (second sub-objective)*. An investment project that has no other source of funds on reasonable terms, than the IFC, is preferred for financing to another that has alternative funding.

The majority of the finance must come from local and or foreign private sector partners. The extent of the non-IFC finance involvement in an investment project is positively correlated with the IFC preference for financing it. Therefore, the Involvement of Other Institutions (Local and Foreign, and DFIs) constitutes the first sub objective.

IFC Catalytic Role

IFC must limit its risk in its investments. The ease of executing an exit strategy (first sub objective) indicates the extent of the risk. The other indication is whether the project is a start up or a going concern (Second sub-objective). A project with a track record (Brown field) is considered less risky than, and is thus preferred to, a start up investment (Green field).

Entrepreneurial / Management

Quality of the management team is important, and is judged by their experience and knowledge of the business, their commitment in the business, and their ability to manage business risks (first sub-objective). The quality of the first sub-objective is mitigated or enhanced by the presence of support by international sponsors and or back up expertise (second sub-objective). A project with more of these qualities is preferred to the one with less.

Direct Non-Financial Impact

Direct outcome other than the private sector growth, to improve the quality of people's lives is considered as supporting the overall mission of the World Bank Group. This is in line with the principle of the special contribution, which requires that the IFC should participate in an investment only when it makes a special contribution that supplements or complements the role of the market operators. Other things being equal, an investment where such an additional contribution will be made is given a higher priority than an alternative without it.

Use of IFC Preferred Instruments

This is not a formal objective of the IFC. A Choice Model for the IFC instruments, run separately from this model, revealed that some instruments are more effective and efficient than others in addressing the overall corporate goal. An alternative approach is to treat the instrument use as a constraint when the resource allocation spreadsheet is constructed. The Operations Secretariat officials chose the approach taken here. The normalized preference outcomes of the Choice Model are imported directly to this resource allocation model. The order of preferences is Syndication (B-loans), Risk Management, Advisory Services, Direct Loan (A-Loan), and Equity.

## *Prioritization of Objectives*

Most of these objectives are qualitative and judgements about the importance of each relative to the other can be intuitively made with relative ease. What is not so easy, however, is deciding by how much is one objective more or less important than the other, and the complexity compounds as the number of objectives to be compared increases and as quantitative objectives are

compared with qualitative ones. The AHP methodology helps structure such complexity by enabling pair-wise comparisons to be performed relative to the goal, and then converting such judgements into ratio scale numbers so that they can be measured and synthesized.

The goal, to which the objectives' pair-wise comparisons were made, is:
 'To further economic growth in developing countries by promoting SME development.'

The following is an example of how such comparisons were made, and how the relative priorities were derived, and is shown in following figure.

Figure 1 Deriving Objectives Priorities
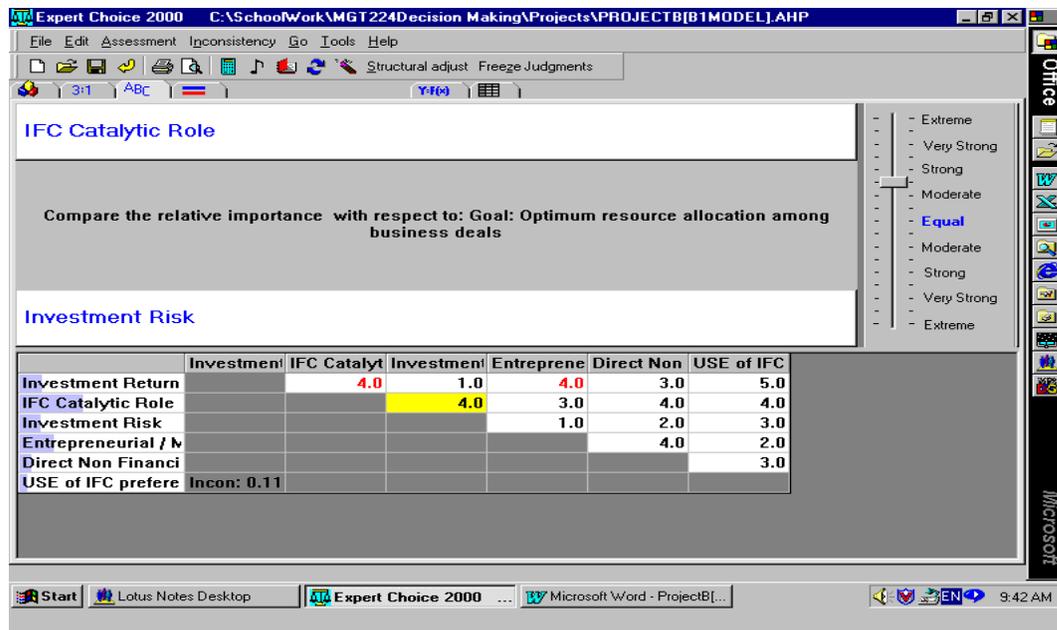
With respect to the goal, the 'catalytic role' objective is judged to be moderately to strongly more important than the 'investment risk ' objective. The rational for this judgement is that the IFC has a higher risk appetite than the private sector. It therefore should value bringing the private sector on board more than it values the reduction of investment risk.

The outcome of the comparisons is reflected by the weights attached to the objectives in the following Figure.

Figure 2 Objectives Priorities
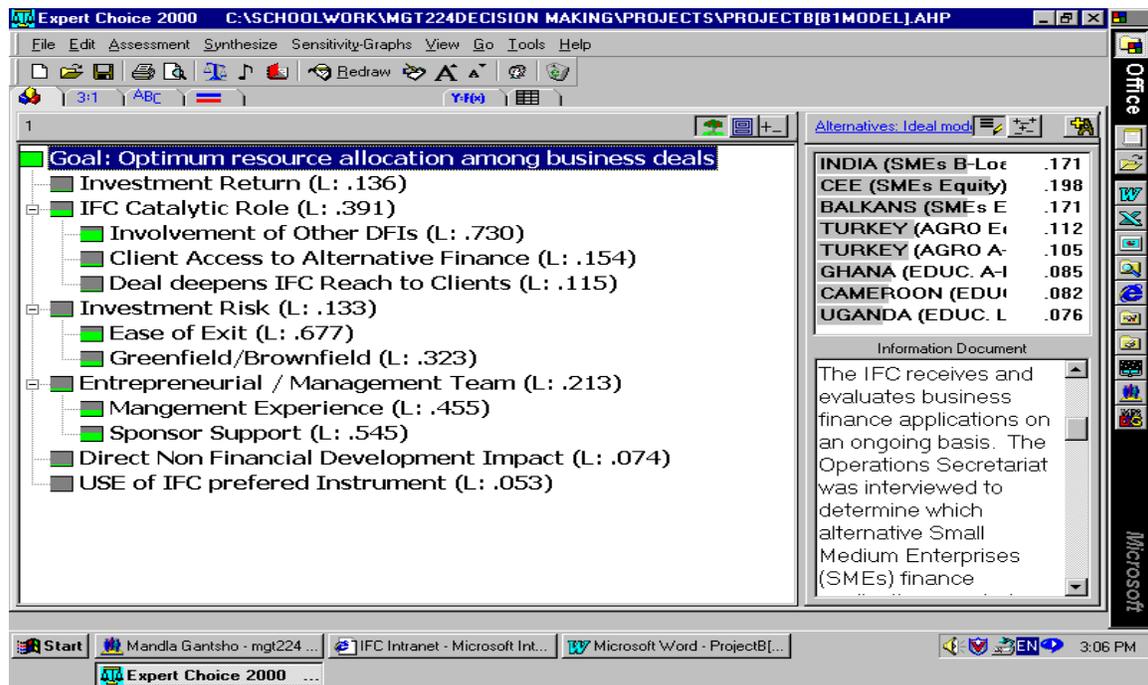
The left window in the figure above shows that, among the parent objectives, the Catalytic role of the IFC is considered to be the most important objective (39.1% weighting). It is 1.84 times more important than the next most important objective, i.e. the Entrepreneurial / Management Team one.

Intensities for judging Alternatives

A meeting was held with three Operations Secretariat staff to determine the scale of intensities for the objectives so that the investment alternatives could be evaluated. The staff members were resistant to defining intensity scales with more than four intensities.[2] The resultant intensities and formula types varied from objective to objective, as follows:

- Three point scale from *non-existent* to *limited* to *available*, for alternative sources of funds for the client;
- Four point scale from *strong*, *moderate*, *tad* to *none*, for deepening IFC 's reach to clients;
- Increasing concave formula for investment returns; and
- Direct input of intensities for the IFC instruments used.

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[2] It was however pointed out that having more intensities allows for a wider range of priorities to be derived which might be important especially in resource allocations where projects differ in cost by an order of magnitude or more. A copy of the model was already included in the investment committee file, therefore no changes could be made to the model.

After agreeing on the levels for the intensities, the group derived the priorities for the intensities through a pair-wise comparison of intensities with respect to the covering objectives. As an example, an investment alternative that is judged to have a easy exit risk will receive a benefit (priority) for that contribution that is 12.5 times more that the one that has a difficult exit risk.

The next step was to rate the candidate investment alternatives against the objectives, using the agreed intensities. This was done as a group exercise. The ratings were based on the degree of contribution that each alternative investment makes towards achieving the objectives. Figure below shows the formula type, the objectives and associated ratings, and the total benefit (Priority) contributed by, and amount required for each alternative investment project.

Figure 3 Objectives' Intensities for Alternatives

The cost column amounts to $49,919 million. The available budget is $40 million. In the next section, the total benefit column is used to allocate the $40 million to the $49,9 million worth of projects. It is assumed that any one project cannot be partially funded. Therefore, one or more projects will naturally not be funded - the question is, which one(s). Two approaches are used to solve this funding question. The first approach is based on Benefit/Cost ratios and the second maximizes the benefits by using the Expert Choice 2000 Advanced Solver Optimization capability.

Resource Allocation

Benefit / Cost Ratios (Sort & Allocate)

In the figure below, the investment projects have been normalized and a benefit/cost ratio determined by dividing the normalized benefit column by the cost column, and converting the amounts to millions. Projects are then funded starting with the highest benefit/ cost ratio and continuing until the $ 40 million budget is depleted.

Figure 4 Maximizing Benefit/Cost Ratio

	Total			Cum	Cum Ben
Alternatives	Benefit	Costs	B/C	Costs	Benefits
GHANA (EDUC. A-Loan)	0.085	230	0.370	230	0.085
CAMEROON (EDUC. A-Loan)	0.082	338	0.243	568	0.167
UGANDA (EDUC. Loan)	0.076	351	0.217	919	0.243
BALKANS (SMEs Equity)	0.171	6,000	0.029	6,919	0.414
CEE (SMEs Equity)	0.198	8,000	0.025	14,919	0.612
TURKEY (AGRO Equity)	0.112	5,000	0.022	**19,919**	**0.724**
INDIA (SMEs B-Loan)	0.171	10,000	0.017	**29,919**	**0.895**
TURKEY (AGRO A-Loan}	0.105	20,000	0.005	49,919	1.000
Totals	1.000	49,919	0.927		

This method produces the largest benefit/cost ratio while funding as many projects as possible within the budget constraint. Looking at the cumulative cost column, it can be observed that all investment projects, but the Turkey Agro-Industry loan, would be funded. However, only $29,9 million of the $40 million budget is utilized - leaving $10.1 million unused - while the cumulative **benefit/cost ratio** is maximized at 89.5%. Assuming that there is no other comparable opportunity for the residual funds, this approximates an optimum solution.

Maximizing Benefits (Use of the Solver Optimization)

Keeping the assumptions constant, the two methods yield the same result, as reflected under Scenario1 in the figure below.

Figure 5 Maximizing Benefits

Maximizing Benefits					Scenarios			
	Total				1	2	3	Musts
Alternatives	Benefit	Costs	DV's	F.Benefit	F.Costs	F.Costs	F.Costs	
GHANA	0.085	230	1	0.085	230	230	230	0
CAMEROON	0.082	338	1	0.082	338	338	338	0
UGANDA	0.076	351	1	0.076	351	351	351	0
BALKANS	0.171	6,000	1	0.171	6,000	6,000	6,000	0
CEE	0.198	8,000	1	0.198	8,000	8,000	8,000	0
TURKEY	0.112	5,000	1	0.112	5,000	-	5,000	0
INDIA (B)	0.171	10,000	1	0.171	10,000	10,000	-	0
TURKEY (A)	0.105	20,000	-	-	-	-	20,000	1
Totals	1.000	49,919		**0.895**	**29,919**	**24,919**	**39,919**	
Cost constraint					40000	25,000	40,000	
Funded benefit					**0.895**	**0.783**	**0.829**	

The Operations Secretariat staff hinted that the budget could actually be cut to $25 million (see scenario 2 above). At a $25 million budget the two methods yield the following different results.

- The 'Maximizing Benefit/Cost Ratio' method (see Figure 4) would finance all the projects except the India A-loan and the Turkey B-loan, resulting in a cumulative funded benefit of **72.4%** and a cumulative funded cost of **$19,919** million.
- The 'Maximizing Benefit' method (see figure 5 Scenario 2) would finance all but the Turkey Equity and Loan investment projects. In contrast with method one, India B-Loan, would be funded and the Turkey Equity would not. The resulting cumulative benefit is **78.3%**, and the cumulative funded cost is **$24,919** million.

Therefore, the 'Maximizing Benefit' method is a superior method as it can yield better results than the 'Maximizing Benefit/Cost Ratio' method.

For interest sake, a third scenario was run where by the Turkey A-loan must be funded. The Operations Secretariat staff felt that the big size of this project would 'politically' look good in the books of the SME director. This scenario was run with the budget of $40 million. The result is a cumulative funded cost of $39,919 million and a cumulative funded benefit of 82.9%. The funded benefit is lower than under scenario 1, but the budget is almost fully utilized. The budget use would also look good politically.

Conclusion

The methodology and its results excited the Operations Secretariat. They agreed to continue to work with the IFC team member to gain more understanding of the methodology and the Expert Choice software, and to include the results as an addendum to the file for the Investment Committee December meeting.