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01 B.P. 1387
Abidjan 01
Côte d'Ivoire

ABSTRACT

This paper analyzes some of the critical factors that determine project success in the African Development Bank on the basis of data available on 146 projects completed by 1995. The analysis relies heavily on these observed data and does not take into account issues of project quality and implementation which have assumed greater importance since 1995. The paper looks at the relationship between the economic rates of return at appraisal and at completion for some 56 projects where such data were available. First, simple ordinary least squares models are used to explain some of the divergences in the economic rates of return at appraisal and completion stages. This is done by regressing economic rates of return at completion on the rates determined at appraisal. The model is then extended to include sector dummies and time and cost overruns. An alternative specification uses simple probit modeling techniques to assess the effect of a number of variables on the probability of project success. The variables included in the analysis are GDP, population size, project size (proxied by cost), time and cost overruns and sector dummies.

The findings of the study suggest that the rates of return at appraisal are at best weak indicators of project performance. There are invariably huge disparities between rates of return at appraisal and those at completion, suggesting that if not qualified the former might not be good policy guides. Further, the results suggest that a good policy environment, as shown by rates of economic growth, inflation and the country's level of development, is as important for project success as are the project specific characteristics, such as size of project or its sectoral description.

RÉSUMÉ

Le présent analyse certains des facteurs essentiels qui assurent la réussite des projets à la Banque africaine de développement en fonction des données disponibles sur 146 projets achevés à l'horizon 1995. L'analyse repose fortement sur les données observées et ne tient pas compte des questions de la qualité et de la mise en œuvre des projets qui ont pris plus d'ampleur depuis 1995. Le document analyse le rapport entre les taux de rentabilité économique obtenus au moment de l'évaluation et après l'achèvement de quelque 56 projets sur lesquels ces données étaient disponibles. En premier lieu, de simples modèles ordinaires des moindres carrés sont utilisés pour expliquer certaines des divergences de taux de rentabilité économique obtenus au moment de l'évaluation et après l'achèvement du projet. Ce résultat est obtenu par une analyse de régression des taux de rentabilité économique après l'achèvement du projet par rapport aux taux de rentabilité économique obtenus au moment de l'évaluation du projet. Le modèle est ensuite élargi aux variables muettes sectorielles, au facteur temps et au dépassement des coûts. Une autre possibilité consiste à utiliser de simples techniques d'analyse par la méthode Probit pour évaluer l'effet d'un certain nombre de variables sur les chances de réussite d'un projet. Les variables retenus dans l'analyse sont le PIB, la taille de la population, la taille du projet mesurée par le coût, le facteur temps, le dépassement de coûts et les variables muettes sectorielles.

Les conclusions de l'étude révèlent que les taux de rentabilité obtenus au moment de l'évaluation sont, dans le meilleur des cas, des indicateurs faibles de la performance du projet. Il y a invariablement une grande disparité entre les taux de rentabilité obtenus au moment de l'évaluation du projet et ceux obtenus après l'achèvement du projet suggérant que si les premiers ne sont pas assortis de réserve, peuvent ne pas être de bons principes directeurs. En deuxième lieu, les résultats suggèrent qu'une bonne conjoncture comme le montrent les taux de croissance économique, le taux d'inflation et le niveau de développement du pays, est un facteur déterminant de la réussite d'un projet tout comme les caractéristiques spécifiques d'un projet telles que la taille du projet ou sa description sectorielle.

A Statistical Analysis of Determinants of Project Success: Examples from the African Development Bank

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Introduction

The African Development Bank (ADB) Group commenced lending operations in 1967 and had by the end of 1999, cumulative loan and grant approvals amounting to over US$ 36 billion. The project total summed up to 2,327 operations – 27 per cent in agriculture, 24 per cent in the multi-sector category, including adjustment loans and stand-alone poverty alleviation projects, 17 per cent in the transport sector, 15 per cent in industry, 9 per cent in the social sectors, mainly education and health, and 8 per cent in public utilities. As the project portfolio has expanded, so have demands for refined methods of appraisal (Peprah, 1994).

At least since the Second World War, project financing has been an important instrument for transferring resources to developing countries. Projects have increased in complexity as demands on them — sociopolitical, environmental and even cultural — expanded. Other concerns relate to issues of design, implementation and development impact, especially with regard to the achievement of set objectives and outputs, meeting forecast costs and time deadlines, sustainability of benefits to the host population, and achieving acceptable economic rates of return (see ADB, 1995). However, "project effectiveness", increasingly the focus of multilateral institutions and national governments, is still a difficult concept to operationalize (Polh and Mihaljek, 1992).

First, projects differ widely with regard to content, design and conditions under which they are implemented in host countries.[1] Second, while project cycle activities in multilateral institutions are standard practice, it has been difficult to devise common evaluation methods that lend themselves easily to the different circumstances in host countries. For instance, when political and social pressures are accounted for, an objective ranking of performance scores across projects and countries becomes difficult.

Third, project sustainability has generally been linked to the country's ability to fully take over financial and other obligations needed to sustain the operation. Normally, the poorer the country, the harder it is for it to sustain projects for lack of adequate financial resources and managerial and technical competence. For financing institutions, there is thus a dilemma between the wish to eradicate poverty in the low-income countries by initiating socially conscious projects and that of establishing sustainable projects in order to ensure the institution's own viability (English and Mule, 1996; Otieno, 1990).

* Statistics Division, Strategic Planning and Research Department, African Development Bank, Abidjan, Côte d'Ivoire.
** Department of Economics, Göteborg University, Göteborg, Sweden.

Macroeconomic performance in the host country is also a key determinant of project success. Many multilateral institutions have thus increasingly combined project financing with parallel programs directed at economic reforms, as is common in structural adjustment programs. Still, external shocks, such as increases in energy prices, cannot always be accommodated with precision in project design. Further, domestic and regional politics are important influences on performance, while civil strife hinders smooth implementation and often compels donors or co-financiers to withdraw support for projects in the affected countries. In addition, capacities of the financing institution to plan projects, follow them up and provide technical assistance are crucial to overall performance of the project portfolio.

In this paper we use data, on a sample of completed and evaluated projects available at the African Development Bank and macroeconomic data on the countries where these projects have been implemented, to assess some of the determinants of project success. We also look at the relationship between the economic rates of return at appraisal and at completion to illustrate some of the difficulties of operating in a relatively more challenging environment. Methodological issues at appraisal, which could also account for any divergences, are not treated in this paper.

The Bank's Project Analysis Process: An Overview

Project cycle activities typically include the following stages: identification, preparation and appraisal, related to pre-implementation, and monitoring and evaluation. At the appraisal stage, a decision is made on the suitability of a project or program for Bank financing. The appraisal process involves evaluation of the following aspects of the project: technical feasibility, financial and economic viability, institutional capacity, social and distributional concerns, and environmental soundness.

An important aspect of project analysis is the estimation of the financial and economic viability of the projects being financed by the Bank. The internal rate of return (IRR) criterion is normally used, where applicable, to evaluate the adequacy of the potential investment. The internal rate of return of a project is defined as the quantified opportunity cost of capital that makes the net present value of a project equal zero. This occurs at the point where social benefits accruing to the project equal the social costs being incurred. The internal rate of return is, therefore, the maximum interest rate that a project could pay for the resources used, if the project is to recover its investment and operating costs and still break even (Gittinger, 1982).

In practice, the decision rule when using the internal rate of return criterion is to consider a project as economically viable if its rate of return is greater than the alternative rate of return — or in the case of economic analysis, simply the opportunity cost of capital. The alternative rate of return may include such rates of return as domestic interest rates. In a number of countries, however, domestic interest rates are of little value in this regard since they often do not provide a good approximation of the opportunity cost of capital.

It is important to note, however, that the internal rate of return is a relative rather than an absolute measure of a project's worth. Thus a project with a high capacity for income generation and poverty reduction could still have a lower internal rate of return than, for instance, a small highly profitable project with little impact on poverty. Furthermore, lack of a direct method for calculating the internal rate of return implies that resort is taken to a process of trial and error, of course facilitated by use of computer algorithms. However, since a unique internal rate of return for a project may not be available sometimes, one cannot confidently use this criterion to rank different projects – let alone those located in different countries.

Still, the advantage of this approach is that there is no requirement for a subjective estimation of the opportunity cost of capital in discounting benefits and costs. Subjective inputs in the evaluation of the projects are thus minimized. Partly for this reason, international financing institutions, including the African Development Bank, prefer to use the internal rate of return criterion for projects where the method is applicable.

Determinants of Performance: Project and Country Characteristics

The data used in this paper are drawn from the Operations Evaluation Department (OPEV) of the African Development Bank[2], and cover 146 projects, mainly implemented in the 1970s and 1980s, at a total cost of over UA 10 billion[3]. The projects were selected on the simple criteria that they had recorded project completion or audit reports by 1995. Of the 146 projects reviewed, only 56 had actual economic rates of return at both appraisal and completion of project works. This is partly due to the fact that not all projects are required to be subjected to the internal rate of return criterion. The Bank has now broadened the measures of performance to include issues relating to implementation as well as those relating to the likelihood of achieving development objectives. On this basis, the Bank then groups projects into three categories: successful, partially successful and unsuccessful. In Table 1, we present aspects of project performance based on these categories as related to project specific, country, and regional variables.

Table 1 indicates that of the 146 projects included in our sample, 28 per cent were considered successful, 53 partially successful, while 19 per cent unsuccessful. In terms of total cost[4] and size, successful projects tended to be bigger; costing an average of UA 92.4 million, followed by partially successful projects which averaged UA 85.8 million while the total cost of unsuccessful projects averaged less than half this amount. With regard to estimated cost overruns, however, successful projects cost 2.2 per cent less at completion than planned and were completed faster than the other projects — although they still took about 50 per cent longer than planned. Partially successful projects had average cost overruns of 9.3 per cent, but took almost twice the time planned to get completed.[5] However, unsucessful projects had relatively higher cost overruns — twice the sample average. Similarly, time overruns were also high in the case of unsucessful projects – although they tended to be lower, on average, than the level for partially successful projects.

Table 1: Summary of Performance by Project Indicators

Project Classifications	Projects %	Total Cost (UA million)	Cost Overrun %	Time Overrun %
Successful	28	92.4	-2.2	49
Partially Successful	53	85.8	9.3	94
Unsuccessful	19	34.0	14.0	82
Average	-	70.7	7.0	75

Sample (n) = 146
Source: Compiled by the authors from the OPEV database.

Table 2 presents project performance indicators by sector. Consistent with the structure of the African economies as well as the Bank's general lending thrust, agricultural projects constitute the largest proportion in the sample at 33 per cent; transport projects comprise 31 per cent, social projects 16 per cent, while industry and multisector projects — the latter mainly in support of adjustment programs — account for 12 and 8 per cent, respectively. However, in terms of cost (and thus size), multisector projects in the sample accounted for close to UA 390 million each, followed by social sector projects, mainly in education and health, at UA 136 million per project, and industry projects at close to UA 120 million per project.

Table 2: Summary of Performance by Sector

Sector	Projects %	Cost (UA million)	Cost Overrun %	Time Overrun %	Project Classification: Successful %	Partially Successful %	Unsuccessful %
Agriculture	33	24.5	12.5	97	23.6	52.6	23.8
Industry	12	117.6	3.7	17.4	78.6	1.0	20.4
Multisector	8	386.7	2.4	73	22	44	34
Social	16	136	8.8	103	17	55	28
Transport	31	17	9.7	86.5	22	69	9

Sample (n) = 146
Source: Compiled by the authors from the OPEV database.

Though numerous, projects in agriculture and transport were relatively small, with an average of about UA 25 million and UA 17 million, respectively. Furthermore, agriculture and transport projects had above average cost and time overruns (see also Table 1). Cost overruns were low for multisector and industry projects, registering 2.4 and 3.7 per cent, respectively. While industrial projects have time overruns that are considerably below average, multisector projects took over 70 per cent longer than planned to complete. However, the worst cases of delay were recorded in the social sector where projects in the sample took twice as long as planned to complete.

With regard to project success, the outstanding sector was industry with close to 80 per cent of the projects considered successful. The success rate in the other sectors was quite low, with agriculture, the multi-sector, transport and social sectors registering rates below 24 per cent. The low rates of success in the latter sectors were compensated somewhat by rather higher rates of partially successful projects.

In Table 3, we look at performance by size of project, with project cost at completion used as a proxy for project size. Close to 60 per cent of the project sample are accounted for by the two smallest size groups, with project costs of less than UA 20 million. The medium-size group, UA 20-50 million, accounted for about 19 per cent of the project sample, and projects costing above this amount accounted for close to 25 per cent of the sample. The information in the table also indicates the not surprising fact that smaller projects are easier to keep within cost estimates.

Table 3: Project Performance by Size*

Project Size (UA million)	Projects %	Cost Overrun %	Time Overrun %	Project Classification		
				Successful (%)	Partially Successful (%)	Unsuccessful (%)
0-10	32.8	-5	92	24	54	22
10-20	24	18.3	77	23	50	27
20-50	18.6	12	108**	23	65	12
50-100	9	6.5	62	30	54	16
100-400	12	9.2	50	40	50	10
Over 400	3.6	3	53	50	50	0

Sample (n) = 146
* size is here proxied by the cost of the project at completion.
** this cost group had a project with a time overrun of 1,097 per cent.
Source: Compiled by the authors from the OPEV database.

In our sample, the smallest projects cost less at completion than had been planned. However, for the next level of project size (UA 10-20 million), cost overruns increase dramatically, indicating a curious discontinuity between the two groups at the lower end (in effect a doubling of cost between the first and second groups). It is plausible to surmise that the increase in size implies increased responsibilities of administration, monitoring and technical assistance that may make projects at this level more complex than the smaller ones. Still, time overruns seem to decline with project size.

Since the two smaller project categories are more common in low-income countries, the discrepancies point to lack of capacities in these countries for managing projects of increasing complexity. In the upper end of the size distribution, cost and time overruns are reduced — suggesting that bigger projects ordinarily go to countries with better capacities for management. The noticeable decline in time overruns for larger projects also suggests that bigger projects need not necessarily imply an increase in time delays. With regard to project success, a review of the data indicates that larger projects perform better — averaging about 40 per cent success rate compared with less than 24 per cent for small to medium-size projects. The data could also be presented by region of ADB operations as in Table 4. The Bank had five main operational regions during the sample period: Central with 19 per cent of operations, East (19 per cent), North (16 per cent), South (24 per cent), and West (22 per cent). Projects in the North Region, where countries are bigger and relatively richer, cost UA 226 million on average, while those in the West and East cost less than half that, at UA 105 million and UA 99 million, respectively.

On average, projects in the South Region cost UA 44 million while those in the Central Region cost UA 26 million — the smallest average cost. In terms of cost overruns, projects in the South cost an average of 8 per cent less than planned. The West had an average cost overrun of 22 per cent, while in the East Region the level of cost overrun is about 13 per cent. With regard to time overruns, projects in the South Region had average completion delays of some 50 per cent, while those in other regions were delayed by over 75 per cent, reaching 90 per cent in the case of

Table 4: Summary of Project Performance by Region of Bank Operations*

Region	Projects %	Cost (UAmillion)	Cost Overrun %	Time Overrun %	Project Classification Successful %	Partially Successful %	Unsuccessful %
Central	19	26	5.2	87	19	59	22
East	19	99	12.6	76	22	44	34
North	16	226	6.6	91	64	36	0
South	24	44	-7.8	52	33	58	9
West	22	105	22	90	13	61	26

Sample (n) = 146
* The regions of operations equated roughly with Africa's geographical divisions (see the ADB's Annual Report, 1994, for a list of the countries in each region). This division was, however, altered in 1995.
Source: Compiled by the authors from the OPEV database.

the North and West Regions. In terms of project success, the North Region showed a project success rate of up to 64 per cent, a factor closely tied to size, with the remainder of the projects classified as partially successful. Available information indicated no unsuccessful projects for the North Region. Projects in the West Region, on the other hand, registered the lowest success rate at 13 per cent – while partially successful projects in the region accounted for 61 per cent and unsuccessful ones 26 per cent.

Table 5 provides information linking project performance to development indicators of the host country. The rationale for the choice of economic variables is based on the premise that prospects for project success are better in economies that have achieved macroeconomic stability, have access to adequate foreign exchange to allow for substantial imports, have sustainable

Table 5: Project Performance by Development Indicator*

Project Classification	Export/GDP Ratio (%)	Inflation (%)	GDP Growth (%)	Population Size (Million)	GNP per capita US$	Human Development Index
Successful	24	11.7	3.9	12.4	565	0.518
Partially Successful	22	59**	3	8.8	576	0.436
Unsuccessful	17.8	19	2.6	7.5	655	0.409
Average	21.3	29.9	3.2	9.6	599	0.446

* The macroeconomic indicators are averages for the period 1974-94, the GNP figures are for 1994.
** Note that two of the projects considered partially successful were from a country which experienced inflation rates of over 1,000 per cent during the period.
Sources: IMF, International Financial Statistics (various issues), ADB Statistical Databases, and UNDP, Human Development Report, 1996.

population levels, and sufficient human capacities[6] . The Table also shows that the export/GDP ratio, a proxy for foreign exchange availability, averaged 24 per cent for countries where successful projects were located. Countries with partially successful projects had, on average, an export/ GDP ratio of 22 per cent, while countries with unsuccessful projects recorded a ratio of about 18 per cent. With regard to inflation, countries where successful projects were located showed relatively low inflation of about 12 per cent, while countries with partially successful projects showed inflation rates as high as 59 per cent. However, this high inflation level was because two of the partially successful projects were located in a country that had undergone episodes of hyperinflation in the 1980s. With the two projects removed, average inflation for these countries falls to below 15 per cent.

Economic growth is also shown to have a positive relationship to project success, though the differences in growth rates between the different performance categories are not large. Regarding the indicator of GNP per capita, there appears to be no clear-cut indication that a high GNP per capita translates into better project performance. Successful projects were not necessarily located in countries with the highest per capita GNP. It would seem, on the other hand, that projects do better in countries with larger populations. Similarly, the human development index is positively related to project performance – with successful projects being located mainly in countries with a higher quality of life (as reflected by the index in Table 5).

Statistical Methodology and Results

There are a number of factors that could influence the post-appraisal potential of a project. Thus the implementation of development projects is shrouded with a considerable degree of uncertainty. This uncertainty is often indicated by the disparities between the economic rate of return at appraisal (AERR) and that estimated at project completion (CERR).

Table 6 presents basic statistics on economic rates of return at appraisal and completion for a total of 56 projects, for which both types of data were available. The Table shows considerable variation and spread among the two rates. Economic rates of return at appraisal range from 6.1 per cent (for the construction of an international airport in Guinea-Bissau) to 46.8 per cent (for a road rehabilitation project in the Central African Republic). The latter project had an economic rate of return at completion of only 14.8 per cent – close to 70 percent off target. On the other hand, the airport project in Guinea-Bissau had an economic rate of return at project completion of -7.6 per cent – a shortfall of over 13 percentage points below the estimate at appraisal. Still, some projects had exceptionally high economic rates of return at project completion, notably the water project (in Mali) which had a CERR of 43.8 per cent (see Table 6).) The average rate of return of projects in the sample was 16.2 per cent at appraisal and 13.7 per cent at project completion. Though this would indicate that project performance at completion is close to target, many projects in the sample indicated low rates of return with overall averages boosted by a few exceptional performers.

As pointed out earlier, it is also noteworthy that projects implemented by the Bank, on average, take longer than planned at the appraisal stage. With regard to the 56 projects reported in Table 6, projects took almost twice as long to implement – on average 30 months later than estimated at appraisal. On the other hand, project costs were on average 7 per cent higher than estimated at appraisal. There is thus generally some difficult in using economic rates of return at appraisal to predict economic rates of return at project completion.

Table 6: Summary Statistics for the 56 Projects

Indicator	Mean	Median	Maximum	Minimum	Standard Deviation
Economic rate of return (%)					
At appraisal (AERR)	16.2	13.9	46.8	6.1	8.9
At completion (CERR)	13.7	9.7	43.8	-7.6	11.9
Total project cost (Million UA)					
At appraisal	26.6	13.6	140.9	2.3	30.3
At completion	27.3	15.6	140.9	1.94	31.0
Cost overrun (%)	7.0	0.0	186.4	-57.4	40.6
Time overrun (%)	93.7	23.0	1,097.5	-41.6	158.3
Time overrun (months)	29.7	48.8	131.7	-3.1	27.3

Source: Compiled by the authors from the OPEV database.

On the whole, 66 per cent of the projects had rates of return at project completion which were lower than estimated returns at appraisal. A further breakdown shows that 50 per cent of the projects had rates of return at completion (CERR) below 10 per cent, 25 per cent had rates below 5 per cent and 5 per cent of the projects had negative CERR. The implication of these results is that a lot of benefits in project implementation could be obtained if the factors that lead to project failure could be identified (Pohl and Mihaljek, 1992).

OLS Regression Results

In Figure 1, economic rates of return at appraisal (AERR) are correlated with economic rates of return at completion (CERR) in a scatter diagram. Most of the points in the figure represented by each project are below the 45-degree line, revealing that the CERR of most projects are lower than the AERR. This outcome is also confirmed by the simple ordinary least squares (OLS) estimation result in Table 7 for model 1 with a negative coefficient for the intercept and a positive one for AERR — indicating that CERRs are, on average, lower than AERRs, even for cases where AERRs are very low. For example, a project with an AERR of 7 per cent has a CERR of 5.9 per cent [i.e., -0.015+(0.85*7)], and one with an AERR of 46 per cent has a CERR of 39 per cent [i.e., -0.015+(0.85*46)].

Besides the simple correlation shown in Figure 1 and Model 1, we extended the OLS model by including cost and time overruns as explanatory variables of the level of the economic rate of return at completion (see Model 2, Table 7). The regression results showed little correlation between the economic rate of return at completion and the cost and time overruns. But as would be expected, the economic rate of return at completion is strongly correlated to that at appraisal, though magnitudes vary considerably.

The model was extended to control for sector considerations in project performance. Dummies were introduced for projects in the agriculture, industry and transport sectors. Although the resulting parameter estimates for the intercept and sectoral dummy variables were not significant, some practical inferences could be drawn from these results. For instance, if we assume an average rate

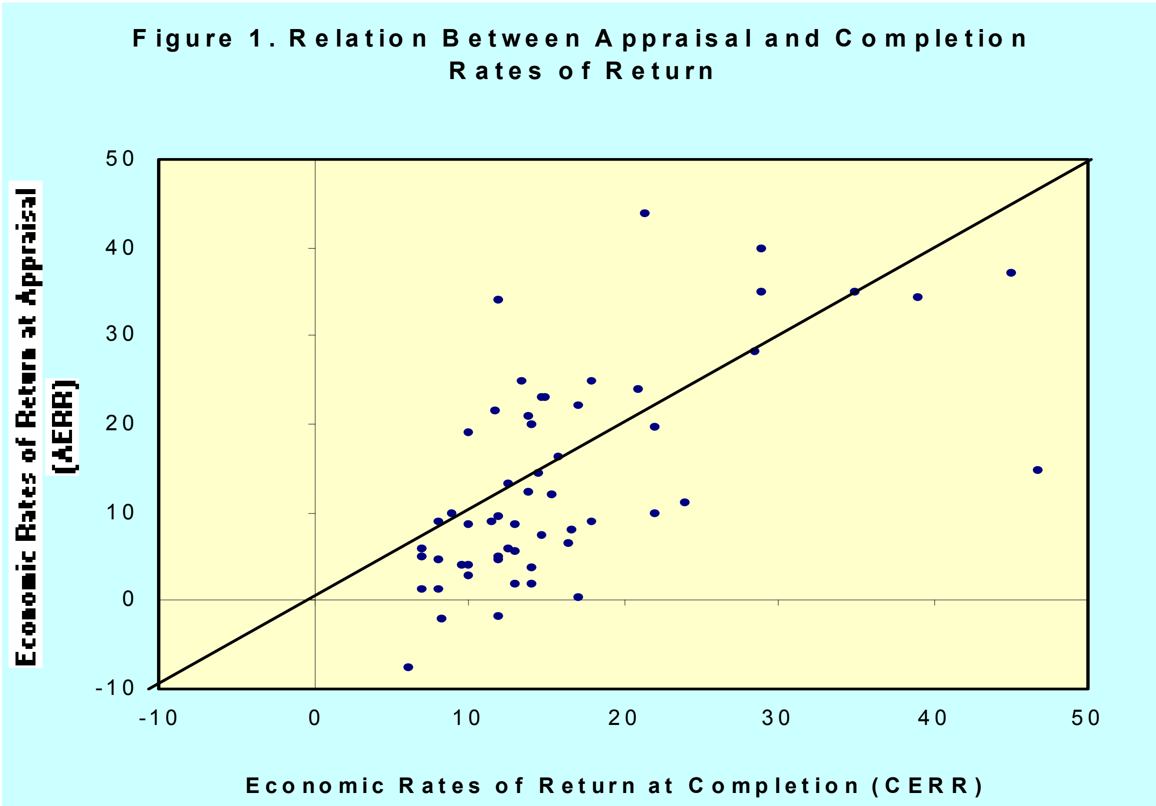

Table 7: OLS Estimates for Models Explaining Divergence in ERR

Dependent Variable : Completion Economic Rate of Return (CERR)				
Explanatory Variables	Regression Statistics (OLS)	Model 1	Model 2	Model 3
Intercept	Coefficient	-0.015	-0.80	3.22
	Std. Error	2.57	2.74	4.14
Appraisal Economic Rate of Return (AERR)	Coefficient	0.85	0.84	0.87
	Std. Error	0.14	0.14	0.14
Cost Overrun (%)	Coefficient	-	0.02	0.02
	Std. Error	-	0.03	0.03
Time Overrun (%)	Coefficient	-	0.05	0.26
	Std. Error	-	0.82	0.82
Sectoral Dummy Variable				
Agriculture	Coefficient	-	-	-4.10
	Std. Error	-	-	4.46
Industry	Coefficient	-	-	6.69
	Std. Error	-	-	7.63
Transport	Coefficient	-	-	-5.52
	Std. Error	-	-	4.23
	Adjusted R^2	0.39	0.38	0.38
	F-Statistic	37.04	12.19	12.19
	S.E. of regression	9.26	9.39	9.39
	No. of observations	56	56	56

Source: Authors' calculations.

of return of 15 per cent at appraisal, projects implemented in these sectors would be expected to have a rate of return of about 13 per cent at completion [i.e. 15%*0.87]. In the agricultural sector alone, economic rates of return at completion would be expected to average about six percentage points below the appraisal estimate [i.e., -4.10+(15%*0.87)]. Similarly, projects in the transport sector, would be expected to have rates of return seven percentage points below at completion of project works [i.e. -5.52+(15%*0.87)]. Industrial projects, on the other hand, would be expected to record completion rates of return five percentage points above the assumed average at appraisal.

Results of the Probit Analysis[7]

A probit model was used to assess the effect of a number of variables on the probability of project success (see Appendix for an outline of the model). As in the tabular presentations at the beginning we use the larger sample of 146 projects. Using the three criteria cited above: successful, partially successful, and unsuccessful, we set all projects declared successful equal to 1 and the rest equal to zero. This yielded 41 projects that were successful with the rest classified as not successful. Using a probit model approach, the problem was reduced to finding the factors that influence the probability for project success.

The explanatory variables used (see Tables 1-5) include: dummy variables for regions, with a project in region "i" acquiring the value 1 or 0 otherwise; and dummies for the sectoral designation, with a project acquiring value 1 if belonging to a particular sector or 0 otherwise. Other variables relate to project specific data such as total project cost in millions of Bank Units of Account, cost overrun in per cent and time overrun in per cent. Variables to capture the domestic economic environment — the average growth rate of the economy as well as the size of the population – were also included for the implementation period 1974 to 1994.

Tables 8 and 9 present results of the probit analysis. Generally, the levels of significance of the coefficients were low, though one can still derive interesting inferences from the size of the coefficients and the signs. First, relative to projects in the North Region[8], all other regions had a negative coefficient, indicating that there was a relatively higher probability for project success in the North Region (although the insignificance of the coefficients precludes any firm conclusions).

Table 8: Results from the Probit Estimation of the Determinants of Project Success

Variable	Coefficient	T-ratio	Mean of X
Constant	-0.972	-1.7	-
REGC	-0.21	-0.41	0.18
REGS	-0.149	-0.33	0.23
REGW	-0.446	-0.88	0.21
REGE	-0.482	-1.13	0.18
SAG	0.24	0.69	0.26
SIND	1.4	2.82	0.1
STRAN	0.112	0.31	0.25
SSOC	-0.36	-0.78	0.12
APC	0.0007	0.16	76
COR	-0.009	-1.7	6.9
TOR	-0.0012	-0.94	79
GDPR	0.101	1.53	3.3
POP	0.02	1.47	9.6

Source: Authors' calculations.

Table 9: Marginal Effects: Impacts of Marginal Changes in the Explanatory Variables

Variable	Coefficient	T-Ratio
ΔConstant	-0.3	-1.75
ΔREGC	-0.066	-0.41
ΔREGS	-0.46	-0.41
ΔREGW	-0.14	-0.88
ΔREGE	-0.15	-1.12
ΔSAG	0.075	0.69
ΔSIND	0.44	2.74
ΔSTRAN	0.035	0.31
ΔSSOC	-0.11	-0.78
ΔAPC	0.0002	0.16
ΔCOR	-0.0027	1.8
ΔTOR	-0.004	-0.91
ΔGDPR	0.031	1.54
ΔPOP	0.006	1.47

Note: The delta "Δ" in front of the explanatory variables refers to a marginal change. The regression measures the impact of small changes in the explanatory variable on the response.
Source: Authors' calculations.

The variables are defined as follows:

REGC = if the project is in the Central Region, then, REGC=1, otherwise REGC=O
REGS = if the project is in the South Region, then REGS=1, otherwise REGS=O
REGW = if the project is in the West Region, then REGW=1, otherwise REGW=O
REGE = if the project is in the East Region, then REGE= 1, otherwise REGE=O
SAG = if the project is in the agriculture sector, then SAG=1, otherwise SAG=O
SIND = if the project is in industry sector, then SIND=1, otherwise SIND=O
STRAN = if the project is in the transport sector, then STRAN=1, otherwise STRAN=O
SSOC = if the project is in the social sector, then SSOC=1, otherwise SSOC=O
APC = Project cost at completion in millions of Bank Units of Account
COR = Project cost overrun in per cent
TOR = Project time overrun in per cent
GDPR = Economic growth (for the periods)
POP = Population of the country in millions

All sector dummies, except for the social sector, are positive. Again in a relative sense this would indicate that compared to the multi-sector projects, projects in agriculture, industry, transport have a higher probability for success, while those in the social sector would tend to fail. Moreover, the coefficient for the industry sector is large and highly significant. This supports what was noted earlier that industry projects have a higher probability for success than the rest (at least in the present sample).

Turning to project-specific data, project size, proxied by the total project cost, had a positive sign but with an insignificant coefficient. While the positive sign on the coefficient for size may point to the fact that large projects are less likely to fail since host governments take better care of them – through preferential allocation of more financial and human resources. Further, large projects often have a large number of financiers resulting in better project supervision and thus increasing the chances for success.

Cost and time overruns had negative impacts on project success, with the coefficient for the cost-overrun variable significant at the 90 per cent level. The two proxies for the domestic environment, economic growth and the size of the population, were both positive, at reasonably significant levels. This would imply that growing economies sustain projects better, while relatively large countries (at least in terms of population size) also record better project performance. Table 9 presents marginal effects, indicating the impact of minor changes in the exogenous variables. The impacts are largely in the same direction as in Table 8. Additionally, positive changes in GDP in the host country increase the probability for project success, as does population size. Increases in cost and time overruns, on the other hand, lower the probability for project success.

Conclusion

The character of this paper has been exploratory in nature. Its purpose has been to attempt to use statistical tools to analyze the factors that determine project success in the African Development Bank on the basis of data available on projects completed by 1995. In this regard the paper has been able to demonstrate, using relatively simple techniques that there are broad sectoral differences in project performance. The probability for project failure rises when the project is in the social sector, for example, while its probability for success rises when the project is in industry. We have emphasized all along, however, that the results derived must be tentative until a larger project sample is exposed to similar scrutiny.

The analysis has also been conducted, again for lack of data, on the assumption of an adequately effective operation on the Bank's side so that the probability for failure is mainly due to exogenous factors. An extension of this study could look at the nature and quality of the project process, by including factors related to project preparation and implementation, including the amount of time expended by the Bank's project officers. Issues of project quality, which have taken on increased importance since 1995, could also be incorporated in the study. These aspects have not featured in the present analysis for lack of data. We have also relied rather heavily on the assumption that the macroeconomic environment has an overwhelming impact on performance. Extending this study to include some two or three country case studies could provide more specific details on the underlying relationship between the macroeconomic environment and project performance. In the increasingly liberalized African economies, however, it would also seem that micro issues such as the nature of the infrastructure would, for the most part, have more impact on projects than issues such as foreign exchange availability.

Notes and References

1. For example, among 28 completed projects evaluated by the African Development Bank around 1995 were those in irrigation, rural development, agro-industry, roads, posts and telecommunications, hydroelectric power, sewerage systems, industry, education and health, as well as policy-based lending (ADB, 1995).
2. The former is a fairly new department within the Bank, having been established in 1987, while the Bank itself had embarked on operations more than twenty years earlier.
3. The African Development Bank's Unit of Account (UA) is equivalent to the SDR of the IMF (1 UA was about US$1.49 as at end of 1995).

4. The total cost of the project includes loans and grants provided by the ADB Group and any other co-financiers as well as the contribution made by the host government.
5. Due to long delays caused by internal strife, some projects took much longer to complete than planned. Time overruns are much larger than cost overruns because financing institutions may stop disbursement at the inkling of trouble, and such unfinished projects accumulate time before completion.
6. The macroeconomic variables were averages for the period 1974-1994.
7. The LIMDEP software package was used for Probit Analysis (see Green, 1992).
8. Note that to estimate the probit, one of the dummies in each of the explanatory groups (the dummies for the south region and multisector projects) had to be dropped.

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Appendix

1. The OLS Regression Model

1.1 The form of the OLS regression model used in this paper is as follows:

$$y_i = f(\mathbf{X}_i; \mathbf{ß}) + \mu_i \qquad i = 1,2, \ldots, p$$

where 'y' is a vector of the dependent variable (CERR);
f(Xi; ß) is a mathematical function of the 'p' explanatory (independent) variables
$X_i = (x_{i1},\ldots,x_{ip})$; and

ß is a vector of 'k' unknown parameters ß= $(ß_1,\ldots ß_k)$.

1.2 It is assumed that the various OLS assumptions are met. For details see, for example, Abraham & Ledolter, 1983; and Afifi & Clark, 1990.

2. The Probit Model

2.1 The probit model used here assumes an underlying response variable 'yi*' defined by the regression relationship:

$$yi^* = b'xi + \mu i$$

2.2 In practice, 'yi*' is unobservable and what is observed is a dummy variable 'y' defined by: "y=1 if yi*>0; y=0 if otherwise".

2.3. The probability of a response is presented as (y=1) = p=C+(I-C)F(x'b) where 'F' is the cumulative distribution function for 'μ'; 'x' is a vector of independent variables; 'p' is the probability of a response. For the related maximum-likelihood expression, see for example, Maddala, 1983 and Hsiao, 1993.