EVALUATING THE FINANCIAL PERFORMANCE OF THE NATIONAL RAILWAYS OF ZIMBABWE (NRZ).

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ABSTRACT

Parastatal reform is an important part of economic restructuring. Although there has been a recent recovery, on the whole, since independence in 1980 the financial and operational performance of National Railways of Zimbabwe (NRZ) has declined. This paper attempts to identify and evaluate the factors which determine the performance of this parastatal to permit ready focus for policy decision makers. Accordingly evaluate the recent financial performance of NRZ via ratio analysis. In the second part of the paper regression analysis is used to determine the factors which most influence the performance measures of NRZ. This elicits discussion on the impact of the restructuring reforms taking place, and the extent to which greater emphasis on a more market oriented approach to public sector railway transport management might yield positive economic results.

INTRODUCTION

An efficient and well managed transport network is essential for long term economic development. The importance of an efficient railway transport network is further heightened by the fact that Zimbabwe is a land locked country which not only handles goods and passengers with trips generated within the country but a considerable proportion of through traffic.

The performance of the public sector in the management and performance of transport (primarily rail transport) organisations has been much criticised. See Hibbs (1989) and Starkie (1989). The appropriate policy with which to achieve the required level of efficiency has also been the subject of considerable debate. See for example, Hutchinson (1991). Governments faced with political as well as economic objectives have not had the freedom to pursue fully market oriented policies. Instead they have relied heavily on subsidies to support non-economic operations. This policy has been criticised extensively. Bly, Webster and Punds (1980) Gomez-Ibanez (1976, Lamare (1981) Cervero (1982) and Nice (1988). Another strand of research (Hartry (1978) and Hayward and Kuper (1978) albeit; not solely directed at transport, has attempted to evaluate the specific factors which determine productivity, i.e.; efficiency and effectiveness. In this context efficiency is defined as the ratio of benefits to costs while effectiveness is defined as output or achievement relative to a goal or performance standard. To improve performance it is therefore necessary to increase the ratio of benefits to costs and increase progress towards some established goal.

National Railways of Zimbabwe (NRZ) is a useful company with which to evaluate the above issues. It operates as a rail transport monopoly (which may or may not imply a total transport monopoly). Yet limited direct competition may have led to some inertia on the part of management as it tends to do elsewhere.[1] It has also been suggested that NRZ does not

provide benefits that are sufficient to justify its costs and that poor performance is supported by a high level of subsidy.[2] However although it is not in a full market environment NRZ does provide annual financial reports and accounts which can be used to evaluate it's performance.

As NRZ is a state-owned corporation governed by an Act of Parliament which sets out broad policy guidelines concerning *inter-alia* its legal status, relations with other organisations, obligations to the State, responsibilities to commerce and industry, and accounting procedures. It is exempt from paying tax in terms of the third schedule of the Zimbabwe Income Tax Act (Chapter 181).

Many of NRZ's early and current problems are the result of loss of skilled and professional manpower soon after independence, inadequate foreign exchange to facilitate the purchase of spare parts, new equipment, and rolling stock,; rising operational costs and uneconomic rates forced on NRZ by the government and finally, lack of suitable investment, such as, signalling systems that would help in improving transit times of trains. All these factors have led to a deterioration in financial performance as the analysis will show.

FACTORS WHICH INFLUENCE THE PERFORMANCE OF NRZ

The performance of NRZ as any other type of organisation is affected by organisational behaviour issues such as staff motivation, development, skill etc. In comparison to their regional neighbours NRZ staff are well qualified and experienced in railway transport management. Accordingly NRZ acts as a consultant to railways of neighbouring countries. As a result of the problems in South Africa there is a well established record of co-operation among regional railway managers in the south-est Africa region. Currently NRZ is collaborating with Botswana Railways on the Limpopo rehabilitation programme which involves the decking of 14 bridges for Botswana. While these organisational behaviour issues are important they do not feature highly in the analysis as they are arguably more difficult to quantify. More quantitatively decipherable; is how the impact of the vintage of technology of NRZ equipment affects it's performance. In many parts of sub-Saharan Africa there is the erroneous; but still widely held belief that improvements in productivity, efficiency, and effectiveness can be achieved simply by investment in more modern technology. At NRZ, equipment related problems are numerous, and substantial amounts of scarce foreign exchange revenues have been allocated in recent years to overhauling and modernising on old carriages, engines and other rolling stock equipment.

This is a similar strategy to that which has been carried out with mixed results on the US Amtrak railway system; see (Bradley (1985) and Nice (1991). Yet the US experience is that passenger demand does not necessarily increase as a result of new passenger equipment and did not prevent financial losses from occurring in the passenger rail service. Indeed short-run savings are achieved by the postponement of new investment. Dependent on how the investment is to be financed - the short term costs of this postponement is likely to be modest.

Furthermore Hatry (1978) suggests that since public sector officials are motivated by short run concerns - the long-run problems which arise as a result of insufficient investment are left to another cohort of politicians to face. Accordingly equipment modernisation is viewed negatively since it increases short-term costs without necessarily providing the commensurate short-term benefits; consequently it has negative impact on short-term finances.

A second major influence on NRZ financial performance is the price of the service. Typically an immediate response would be to raise prices given that NRZ operates as a railway monopoly. However freight and in particular passenger mode choice would be affected by the large proportion of low income group users, who are price elastic. This would reduce aggregate demand and revenues and would therefore adversely affect the financial performance of NRZ. This is supported by earlier findings; for example, Hilton (1980).

Traffic volume is the other major factor which influences NRZ financial performance. Economies of scale suggest that average costs

decline as fixed costs are spread across increased volume. Rail transportation has high fixed costs and so should subscribe to this tenant.

FINANCIAL RATIO ANALYSIS

This part of the paper uses ten profitability, liquidity, efficiency and investment accounting ratios to evaluate the financial performance of NRZ. The profitability ratios should assist in establishing the profitability of operations. Liquidity ratios assist in determining the likelihood that creditor obligations will be met. Efficiency ratios enable the determination; - from a financial perspective - of the operational efficiency of NRZ in its operations; for example debtor collection period and creditor payment period and investment ratios would reveal the capital structure of NRZ and the extent to which it is financed by long-term loans, shares and debentures.[3]

Since 1980 NRZ has had an operating deficit. In 1990 the deficit reached an all-time high. NRZ operating costs exceeded operating revenue by 9.8%. This was primarily because of an increase in administrative and general costs which increased by 57.9%. However the rationalisation and reform programme instituted in 1989, drastically reduced the deficit to -4.9% and improved profitability in 1991. Part of the reform programme involved annual tariff increases of 20% introduced in July 1990 and January 1991. This had a substantial impact on the total deficit.

Yet NRZ was unable to generate profit from its capital employed. Although a huge surplus of 52.7% is shown in 1991, all of it is due to interest earned from the Railways Unitary System from 1967 to date plus a surplus from the Chicualacuala/Limpopo rehabilitation programme.

In 1988 NRZ earned a profit of 8.0% from sales revenue. See Table 1 in Appendix. However this declined to 4.3% in 1989 and in 1990 a loss of -6.9% was made. This situation appears to have been caused by a disproportionate increase in operating expenditure which increased by 9.6% from 1988 to 1989 and by 43.8% from 1989 to 1990. A substantial amount of this expenditure was on salaries and wages which went up by 37.8% from 1989 to 1990. Fuel increases, because of the Gulf war also contributed to the increase in expenditure.

For a substantial period of time after independence NRZ charged sub-economic tariffs. By the late 80s sales revenue was unable to cover the railway's total costs. Government interference in tariff determination is primarily responsible for this malaise. In the period of high inflation which has prevailed, variable costs of operation have increased as the input prices for fuel, wages and salaries and maintenance has risen. Yet NRZ has been unable to effect proportionate increases in tariffs. For example operational expenditure increased by an average of 28.4% per annum from 1980 to 1990 whilst income increased by an average of 16.1%.

Of recent the liquidity position has not been much better. See Table 2 in Appendix 1. Indeed in recent years NRZ has not had adequate liquidity to meet its short-term liabilities. The situation was particularly difficult between 1988 to 1991 as the ratio of current assets to current liabilities declined from 0.66:1- 0.50:1. Of late there has been an improvement yet the ratio is still 0.74:1 and trade creditors and bank overdrafts constitute 82% of current liabilities. Consequently NRZ pays heavy interest on overdue accounts and overdrafts.

Stocks are a significant proportion of the current assets of NRZ. A consequence of excluding stocks from the current assets and measuring this new value relative to current liabilities would elicit concern because NRZ would only be able to meet about a third of its short-term liabilities. The acid test ratio, as it is often referred to, has progressively declined since 1988, i.e. o.35:1; (1989) 0.33:1; (1990) 0.25:1 although it improved slightly in 1991 to 0.39.1.

NRZ has not been operationally efficient in the use of its resources, therefore the fixed assets have not been able to generate more income. Although the recent rationalisation and reform program is being implemented, it is yet to improve operational efficiency.

Having been given more freedom to manage via the restructuring programme, NRZ's public sector management is now behaving more like the management of a private sector business

facing financial difficulties. Firstly, it has improved it's ability to collect debts while at the same time it now takes longer to pay its creditors; on average from 140 days in 1988 to 174 days in 1991.

However NRZ is still a very highly geared corporation. See Table 3 in Appendix 1. In 1988 about 93% of its capital was composed of long term loans and this rose to 100% in 1990 and then the situation improved to about 60 in 1991. It still has a significant portfolio of loans denominated in foreign currency which still imposes significant financial pressure particularly as a result of the continuous devaluation of the Zimbabwe dollar.

The ratio analysis and the discussion so far indicates that NRZ has been making attempts to improve efficiency and profitability. Many of the Railway's problem emanate from inefficient methods of operations which have tended to increase costs and reduce revenue. The following analysis examines some of these issues in more detail.

FURTHER ANALYSIS

Using a framework similar to that developed by Nice (1991) further analysis is carried out to add to the financial ratio analysis and add more to evaluation of financial performance of NRZ passenger services. Data was collected from annual financial reports for (1970 - 1991).

Several factors have been identified with which to explore financial performance in NRZ. The first is the proportion of expenses which are covered by revenues. The second factor is net loss - the actual difference between revenues and expenses per passenger mile. This is an inflation adjusted used as a proxy for the condition of the NRZ equipment. Of course age is only an approximate indicator of the state in which equipment is in; - factors such as maintenance and servicing no doubt have a major effect on this. However *ceteris paribus* new equipment is likely to generate less maintenance and service cost than older equipment. Another major factor is operating revenue per passenger mile. This is also inflation adjusted by the annual GNP defoliator and is a broad measure.

Accordingly a useful first step in this part of the analysis is to test the impact of the economies/diseconomies of scale hypothesis on the financial performance of passenger services. Two factors were examined; passenger miles, and passenger miles per train mile. The latter factor is useful because it explains the relationship between train miles and passenger miles or more basically the proportion of empty trains used to generate a given number of train miles.

A test of the zero-order relationship between the independent variables was carried out with data for the twenty-one year period 1970-1991 inclusive.(Table 1) While the results were fairly consistent with the hypothesised relationship they differed when financial performance was measured by revenues as a percentage of expenses rather than as net loss per passenger mile.

The impact of higher fares (prices) was examined and findings suggest that increased operating revenues per passenger mile were strongly associated with a higher revenue/ expense ratio (r = 74) and reasonably related to lower net losses per passenger mile (r = 31). In this instance increase service prices has also led to improvement in overall economic performance.

Although the impact on net losses per passenger mile is not very large, the economies of scale hypothesis is partially supported by the fact that as the ratio of passenger miles to train miles increases then revenues would increase relative to costs and losses per passenger mile would decline.

Because of a paucity in data it was difficult to disaggregate NRZ rolling stock into separate categories for carriages and locomotives as in Nice (1991).[4] So the rolling stock independent variable includes both carriages and locomotives.

The results support the view that new investment in equipment increases the likelihood of poor short-run financial performance. The results suggest that as the average age of carriages and locomotives increase then the net loss per passenger mile declines. The proportion of revenues relatives to costs also increases as the average age of carriages and locomotives increases.

Multiple regression of NRZ financial performance for the 21 year period 1970-1991 was carried out. The estimations were carried out with the use of the Dubin-Rivers Statistical Software Tools (SST) package. This has provided quite clear results. Table 2 below illustrates that three factors determine the ratio of NRZ revenue to expenses. In years in which revenue per passenger mile and passenger mile per train mile increased, and the average age of rolling stock increased; the ratio of revenue to expenses increased. The other independent variables had limited explanatory power. A Durbin-Watson test was also used to check for auto-correlation.

The analysis also concerned itself with examining the two measures of financial performance. This procedure was carried out to test whether or not the factors hypothesised to determine financial performance would have as much effect if the definition of financial performance changed. Accordingly two multivariate analysis regressions were carried out in which the same independent variables were used but the dependent variable changed. This was used to examine the two NRZ financial performance measures - Net Loss per passenger mile (Table 2) and revenues as a percentage of expenses (Table 3).

The regression analysis supports the standard view that the high fixed costs faced by operators of passenger rail services declines as passenger demand increases, i.e. that average unit costs of operation decline as quantity produced increases. In the short-run the use of older rolling stock equipment reduces fixed costs, however this is unlikely to be a sustainable long term strategy as variable costs increase over the life cycle method used to depreciate fixed assets the real rate of depreciation measured by annualized increases in the cost of equipment is likely to increase over time. Furthermore an accounting binary dummy variable was used to explore the impact that changes in accounting method from the system employed prior to independence in 1980 and afterwards might have. This proved to be insignificant in determining financial performance.

The data and analysis therefore suggest that there is a strategic railway transport management conflict between short term financial performance and rolling stock modernisation and investment.

CONCLUSION AND PUBLIC POLICY IMPLICATIONS

Nice (1991) suggests in the conclusion of his analysis of the U.S Amtrak system that the fact that financial performance is better when the average age locomotive fleet increases is "somewhat troubling". This may be so, in the US, where the relative costs of equipment may be lower; yet in the case of NRZ; there is nothing "troubling" about this finding. Indeed the restructuring and reform program is already having an impact on performance and although there are plans to purchase new locomotives, equipment and technical assistance this is being linked with improvements in the level of professionalism, efficiency, and competence among employees.

Despite the current changes there is still a bureaucratic culture and large scale government intervention. This slows down NRZ response to transport market conditions and the behaviour of competitors in the road sector. Furthermore the existence of rigid working agreements with trade unions and organised labour makes the introduction of new and more efficient working practices difficult. Given the relative small size of NRZ, the utilisation of 13 different classes of diesel locomotives adds to the costs of operations and reduces any economies of scope in operations that may be obtainable.

Prospects for NRZ are not entirely bleak. Under the auspices of the restructuring and reform program it has rationalised it's organisational structure to improve the quality of it's services. Indeed though not yet analyzed; the current revenue increases suggest that unless there has been a significant increase in overall travel demand; NRZ passenger services is beginning to win back some of the market share that it lost to road. Evaluating this particular topic is one of the issues being addressed in a current survey.[5]

Finally there will be indirect transport economic policy benefits which might arise as the performance and efficiency or NRZ improves.

Government cost of road infrastructure will decline. Public sector financing of road infrastructure via grants and subsidies will decline. As a result railway infrastructure might be financed at cheaper costs to the public sector than otherwise would be the case. There would be less damage to road infrastructure and so arterial road speeds should increase. This should reduce total travel time costs. Increased road speeds would provide genuine competition to air services over short haul origin-destination points. The improved condition of rail infrastructure and introducing private sector involvement in railway operations and management and provide a plethora of positive economic and financial multipliers.

NOTES:

[1] The sunk cost and capital investment involved in railway transportation is so large that it deters entry by potential new entrants. Consequently, introducing effective competition to state railways is expensive and complicated. Despite this, many countries in Africa, e.g. Ghana, Kenya, Nigeria are following or considering (in principle), the introduction of greater private sector involvement in railway operations. One idea (currently under review in Zimbabwe) follows in the footsteps of the proposals being implemented in the UK; in which the railway services are disaggregated into railway operations and track infrastructure provision.

[2] The lack of competition and inefficient utilization of heavy capital investment means that rail transport is often not considered a reliable method of transport by users.[3] Consequently a larger proportion of goods is transportation of goods is transported by road than should be; given the presence of rail infrastructure networks. As a result road infrastructure is used excessively. If this trend continues it might not meet the requirements of passenger travel and other users with higher marginal values of travel/transport time, who need to travel by a faster mode. This is particularly so for transport of perishable agricultural goods and therefore of greater importance to Zimbabwe.

[3] Sales Revenue is derived from the figure of income as shown in the annual accounts, and for purchases, it has been assumed that operating expenditure reasonably represents purchases that are used in the generation of income. The sum of the operating surplus of both rail and road services plus other income as given in the accounts represents gross profit. As the Government of Zimbabwe is the sole shareholder, the capital account plus long term loans have been used as shareholder's funds. For purposes of ascertaining credit sales and miscellaneous income this is assumed to be on a cash basis. Where a ratio contains elements which do not exist in the annual accounts, only those elements of the ratio which do exist are used, for example, the capital gearing ratio shows preference shares which do not exist in the annual accounts, subject to the ratio remaining reasonable and representative.

[4] Accordingly it difficult to establish exactly whether it is the average age of carriages, or of engines, that affects NRZ performance measures more. Nice (1991) suggests that average age of engines is the more significant factor.

[5] It is hoped to carry out a survey of user costs of transport between Zimbabwe and Botswana. The major rail link between Zimbabwe is between Bulawayo and Gaborone via Ramokgwebana. Plumtree is the point of interchange between NRZ and Botswana Railways. The major road links Bulawayo (Zimbabwe) and Gaborone (Botswana) directly. (A distance of 723 kilometres). Average travel times between Gaborone and Bulawayo are 12 hours train, 6.5 hours car and 9-10 hours by bus/heavy goods vehicle. The current survey (on going, at present) will attempt to establish the costs to users of both modes of transport. 'What if?' questions will be asked to estimate transport time and cost for users in both the freight and passenger sectors. The next step will be to use the data to evaluate whether or not users are satisfied with the standard of service which they are currently receiving. It would also provide an inference as to willingness (or lack of) to pay for a more efficient service. There is already some data available; which can be used to supplement the random sample, and the Zimbabwe Ministry of Transport (Roads and Road Traffic), Zimbabwe Truckers Association, and National Railways of Zimbabwe, Botswana Ministry of Transport, Botswana Railways will be involved. The next stage would be to estimate the cost to government of improving the performance of rail transport.

	Revenue as a percentage of Expenses	Net losses per passenger mile
Average Age of Carriages, Engines and Other Rolling Stock	-.17	-.53 *
Passenger Miles	.33 *	-.19
Passenger Miles per Train Mile	.59	-.41
Operating Revenues per Passenger Mile	.74**	-.31

* Significant at 0.5 level. One tailed test N = 21
** Significant at 0.1 level.

TABLE 1. Zero-Order Relationship of Financial Performance

	Original Model		Reduced form Model	
	Co-efficient	T value	Co-efficient	T value
Passenger Miles	- .19	- 1.14 1.93	- .27	- 2.06
Passenger Miles /Train Mile	.51	2.14	3.44	2.12**
Operating Revenue/Passenger Mile		1.74	.76	2.07**
Average Age of Carriages,Engines	2.93	1.13 3.44	29.1 .91	
Accounting Dummy			2.23	2.61
Intercept	.81			
R^2	.61			
Durbin-Watson Test	27.6			
	.93			
	2.76			

(a) Unstandardised regression coefficients
* Significant at 0.5 level
** Significant at 0.05 level

Table 2. Analysis of Net Losses Per Passenger Mile (Inflation adjusted 1970 -1991)

	Original Model		Reduced form Model	
	Co-efficient	T value	Co-efficient	T value
Passenger Miles		1.07	-	-
Passenger Miles/car mile	.09	1.93	.25	3.72
Operating Revenue/Passenger mile	.27	.94	-	-
Average age of Carriages & Engines		1.81	.53	1.97
Accounting Dummy	.11	1.03		
Intercept		2.19**	31.9	
R^2	.62		.84	2.03*
Durbin-Watson Test			2.45	*
	.27			
	31.4			
	.86			
	2.61			

(a) Unstandardised regression coefficient
* Significant at .05 level
** Significant at.005 level

Table 3. Analysis of NRZ Revenues as a Proportion of Expenses 1970-1991 (Inflation-adjusted)

APPENDIX 1

NATIONAL RAILWAYS OF ZIMBABWE: ANNUAL ACCOUNTS: RATIO ANALYSIS CURRENCY (Z$000s)

PROFITABILITY RATIOS	1987-1988 (000s)	1988-1989 (000s)	1989-1990 (000s)	1990-1991 (000s)
Profit after tax and before extraordinary item x 100				
1)Shareholder's Funds	-116666 x100 / 461520 = - 24.8%	-1338272 x 100 / 482198 = - 29%	-228272 x100 / 482198 = - 47.3%	-45009x100 / 918123 = -4.9%
Profit before tax and interest x 100				
2)Shareholder's Funds plus long term loans	-116666+ 51883x100 / 34335 + 436901 = - 13.7%	-116716+ 48386 x 100 / 26947+ 484573 = - 14.8%	-228272+ 53361x100 / 489+ 481709 = -36.3%	428110+ 56079x100 / 405276+512847 = 52.7%
GROSS PROFIT RATIO				
3) Gross Profit x 100 / Total Sales Revenue	21793 x 100 / 272495 = 8%	12229 x 100 / 286994 = 4.3%	-25624 x 100 / 369573 = -6.9%	195819 x 100 / 648649 = 30.2%
NET PROFIT RATIO				
4) Net Profit before tax x 100 / Total Sales Revenue	-16666 x 100 / 272495 = -42.8%	-116716 x 100 / 286994 = -40.7%	-228272 x 100 / 369573 = -61.8%	428110 x 100 / 648649 = 66.0%

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