



ECONOMIC EFFICIENCY OF PUBLIC AND PRIVATE WAREHOUSES IN MAHARSHTRA- A STOCHASTIC FRONTIER APPROACH

KEYWORDS

Warehouses, Net Present Worth, Internal Rate of Return, Benefit Cost Ratio and Economic Feasibility.

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ABSTRACT

Warehousing plays a very vital role in promoting agriculture marketing, rural banking, financing and ensuring Food Security in the country. It enables the markets to ease the pressure during harvest season and to maintain uninterrupted supply of agricultural commodities during off season. Hence, it solves the problems of glut and scarcity, which are the usual problems in agricultural marketing with a view, following objectives were undertaken for study feasibility and efficiency by stochastic frontier model. In Public Warehouses, It reveals that, unit increase in Working Capital, Invested Capital, Inventory, Wages of Workers and Warehousing Cost variables lead to 95 per cent increase in storage income. The unit increase in Number of Employees will leads to cent per cent increase in storage income of MSWC Warehouses. The mean efficiency in MSWC warehouses is about 64 per cent which inculcate that 37 per cent of the above inputs were not efficiently utilized in overall. In Private Warehouses, It reveals that unit increase Working Capital, Warehousing Cost, Invested Capital, Number of Employees, Wages of Workers and Inventory will increase the storage income cent per cent. The mean efficiency in Private warehouses is about 51 per cent which inculcate that 49 per cent of the above inputs were not efficiently utilised in overall.

2. INTRODUCTION

Globally, the USD 100 billion warehousing industry has undergone significant changes in the last decade owing to the growth in world trade and expansion of international markets as well as increasing application of new technology. Internationally, warehousing industry is classified into three different types viz. Public warehousing, Private warehousing and Contract warehousing. Of these, contract warehousing, which has dedicated customers with long-term agreement, is the fastest growing segment of the industry internationally and is expected to grow at a rate of 12-15 per cent over the next couple of years. The warehousing capacity available in India, in public, cooperative and private sector is about 108.75 million MTs (2015). The present study has been undertaken, to examine the progress and comparative analysis of the public and private warehouses in Vidarbha region of Maharashtra by stochastic frontier model.

The specific objectives of this study are as under:

- 1) To study the economic efficiency of selected warehouses
- 2) To study economic feasibility, viability of selected warehouses

1. METHODOLOGY

The Vidarbha region of Maharashtra, India is purposively selected for study purpose. The primary source of data has been collected so as to elicit the first hand information about the functioning of private godowns and Maharashtra State Warehousing corporation and also problems encountered by the user group, owners of private godowns and the officials of Maharashtra State Warehousing Corporation. The secondary source of data has been collected to evaluate the investment pattern, profit arised from different commodities stored, to work out the financial feasibility, economic viability, composition of user groups and capacity utilization etc. Simple tabular analysis, Stochastic frontier model were calculated to work out the economic feasibility, efficiency and viability of selected warehouses.

Stochastic frontier model

Farrell (1957) attempted to measure the efficiency of production in the single input and output case.

$$\ln Y_i = \ln \beta_0 + \beta_1 \ln X_{i1} + \beta_2 \ln X_{i2} + \beta_3 \ln X_{i3} + \beta_4 \ln X_{i4} + \beta_5 \ln X_{i5} + \beta_6 \ln X_{i6} + V_i - U_i$$

Where,

\ln natural logarithm (i.e. logarithm to the base e).

β_i Parameters to be estimated.

V_i are independent and identically random errors

U_i are non-negative random variables.

Inputs Variables

- X1: Inventory
- X2: Warehouse cost
- X3: Working Capital
- X4: Invested Capital
- X5: Number of Employees
- X6: Wages to Workers

Output Variables

- Y: Income

4.3.5 RESULT AND DISCUSSION

Table 4.3.5 Variable Efficiencies in Public Warehouses

Variables	Particulars	Coefficient
Working Capital	β_1	1.85**
Warehousing Cost	β_2	1.965**
Invested Capital	β_3	1.366**
Number of Employees	β_4	1.161***
Wages of Workers	β_5	1.698**
Inventory	β_6	0.988**
Overall	σ	0.465**
Mean Efficiency		0.643
R^2		0.88

*** significance at 1 per cent , ** significance at 5 per cent, * significance at 10 per cent.

It is observed from table 4.3.5, that the independent variables Working Capital, Warehousing Cost, Invested Capital, Wages of Workers and Inventory were significant at 5 per cent, while Number of Employees variable was significant at 1 per cent. It reveals that unit increase in the above inputs will increase the storage income upto 95 per cent. But, in case of Number of employees the unit increase in the input will increase the storage income cent per cent. The mean efficiency in MSWC warehouses is about 64 per cent which inculcate that 36 per cent of the above inputs were not efficiently utilised. The resource use efficiency is upto 88 per cent which shows that only 22 per cent inputs were not efficiently utilised.

Table No. 4.3.5.1 Variable Efficiencies in MSWC Warehouses for the year 2001

Variables	Particulars	Coefficient
Working Capital	β1	1.245***
Warehousing Cost	β2	0.068***
Invested Capital	β3	0.546*
Number of Employees	β4	1.147**
Wages of Workers	β5	0.4788***
Inventory	β6	1.125***
2001	σ	1.153***
	Mean Efficiency	0.540

It is observed from table 4.3.5.1, that in the year 2001, for MSWC Warehouses the independent variables Working Capital, Warehousing Cost, Wages of Workers and Inventory were significant at 1 per cent, while Number of Employees variable was significant at 5 per cent. Invested Capital was significant at 10 per cent. It reveals that unit increase in the Working Capital, Warehousing Cost, Wages of Workers variables will increase the storage income cent per cent. But, in case of Number of employees the unit increase in the input variable will increase the storage income upto 95 per cent. The unit increase in the Invested capital input variable will lead to 90 per cent increase in storage income. The mean efficiency in MSWC warehouses is about 54 per cent which inculcate that 46 per cent of the above inputs were not efficiently utilised in the year 2001.

Table No. 4.3.5.2 Variable Efficiencies in MSWC Warehouses for the year 2002

Variables	Particulars	Coefficient
Working Capital	β1	1.587***
Warehousing Cost	β2	1.456***
Invested Capital	β3	1.256*
Number of Employees	β4	1.587***
Wages of Workers	β5	1.156***
Inventory	β6	1.235*
2002	σ	2.592***
	Mean Efficiency	0.6286

*** Significance at 1% , ** significance at 5% , * significance at 10%.

It is observed from table 4.3.5.2 that in the year 2002, for MSWC Warehouses the independent variables Working Capital, Warehousing Cost, Number of Employees and Wages of workers were significant at 1 per cent. Invested Capital and Inventory were significant at 10 per cent. It reveals that unit increase in the Working Capital, Warehousing Cost, Number of Employees and Wages of Workers variables will increase the storage income cent per cent. The unit increase in the Invested capital and Inventory input variable will lead to 90 per cent increase in storage income. The mean efficiency in MSWC warehouses is about 62 per cent which inculcate that 48 per cent of the above inputs were not efficiently utilized in the year 2002. In this way there following years shows discrete changes in storage, yield from storage and warehousing parameters from 2003 to 2012.

Table No. 4.3.5.3 Variable Efficiencies in MSWC Warehouses for the years in Overall.

Variables	Particulars	Coefficient
Working Capital	β1	1.865**
Warehousing Cost	β2	1.965**
Invested Capital	β3	1.366**
Number of Employees	β4	1.161***
Wages of Workers	β5	1.698**
Inventory	β6	0.988**
Overall	σ	0.465**
	Mean Efficiency	0.643

*** Significance at 1%, ** significance at 5%, * significance at 10%.

It is observed from table 4.3.5.3 that Overall the independent variables of MSWC Warehouses Working Capital, Invested Capital, Warehousing Cost, Inventory and Wages of Workers were significant at 5 per cent. Number of Employees was significant at 1 per cent. It reveals that, unit increase in Working Capital, Invested Capital, Inventory, Wages of Workers and Warehousing Cost variables lead to 95 per cent increase in storage income. The unit increase in Number of Employees will leads to cent per cent increase in storage income of MSWC Warehouses. The mean efficiency in MSWC warehouses is about 64per cent which inculcate that 37 per cent of the above inputs were not efficiently utilised in overall.

Table 4.3.6 Variable Efficiencies in Private Warehouses

Variables	Particulars	Coefficient
Working Capital	β1	1.444***
Warehousing Cost	β2	0.190***
Invested Capital	β3	1.222***
Number of Employees	β4	1.346***
Wages of Workers	β5	1.123***
Inventory	β6	1.233***
Overall	σ	1.012***
	Mean Efficiency	0.515
	R ²	0.64

*** Significance at 1 per cent, ** significance at 5 per cent, * significance at 10 per cent.

It is observed from table 4.3.6, that the independent variables Working Capital, Warehousing Cost, Invested Capital, Wages of Workers, Number of Employees and Inventory were significant at 1 per cent. It reveals that unit increase in the above inputs will increase the storage income cent percent. The mean efficiency in MSWC warehouses is about 51 per cent which inculcate that 49 per cent of the above inputs were not efficiently utilised. The resource use efficiency is upto 64 per cent which shows that only 36 per cent inputs were not efficiently utilised.

Table No. 4.3.6.1 Variable Efficiencies in Private Warehouses for the year 2001

Variables	Particulars	Coefficient
Working Capital	β1	15.41*
Warehousing Cost	β2	1.452***
Invested Capital	β3	0.874***
Number of Employees	β4	0.996***
Wages of Workers	β5	1.666**
Inventory	β6	1.566***
2001	σ	0.5667*
	Mean Efficiency	0.4956

It is observed from table 4.3.6.1, that in the year 2001, for Private Warehouses the independent variables Invested Capital, Warehousing Cost, Number of Employees and Inventory were significant at 1 per cent, while variable Wages of Workers was significant at 5 per cent. Working Capital was

significant at 10 per cent. It reveals that unit increase in the Invested Capital, Warehousing Cost, Number of Employees and Inventory will increase the storage income cent per cent. But, in case of the unit increase in the Wages of Workers input variable will increase the storage income upto 95 per cent. The unit increase in the Working Capital variable will lead to 90 per cent increase in storage income. The mean efficiency in Private warehouses is about 49 per cent which inculcate that 51 per cent of the above inputs were not efficiently utilised in the year 2001.

Table No. 4.3.6.2 Variable Efficiencies in Private Warehouses for the year 2002

Variables	Particulars	Coefficient
Working Capital	β_1	1.737***
Warehousing Cost	β_2	2.003***
Invested Capital	β_3	0.966**
Number of Employees	β_4	1.952*
Wages of Workers	β_5	1.522**
Inventory	β_6	1.652***
2002	σ	0.896***
	Mean Efficiency	0.9808

*** Significance at 1%, ** significance at 5%, * significance at 10%.

It is observed from table 4.3.6.2 that in the year 2002, for Private Warehouses the independent variables Working Capital, Warehousing Cost, and Inventory were significant at 1 per cent, while variable Invested Capital and Wages of Workers was significant at 5 per cent. Number of Employees was significant at 10 per cent. It reveals that unit increase in the Working Capital, Warehousing Cost, and Inventory will increase the storage income cent per cent. But, in case of the unit increase in the Invested Capital and Wages of Workers variables will increase the storage income upto 95 per cent. The unit increase in the Number of Employees variable will lead to 90 per cent increase in storage income. The mean efficiency in Private warehouses is about 98 per cent which inculcate that 2 per cent of the above inputs were not efficiently utilised in the year 2002. In this way there following years shows discrete changes in storage, yield from storage and warehousing parameters from 2003 to 2012

Table No. 4.3.6.3 Variable Efficiencies in Private Warehouses for the years in Overall.

Variables	Particulars	Coefficient
Working Capital	β_1	1.444***
Warehousing Cost	β_2	0.190***
Invested Capital	β_3	1.222***
Number of Employees	β_4	1.346***
Wages of Workers	β_5	1.123***
Inventory	β_6	1.233***
Overall	σ	1.012***
	Mean Efficiency	0.515

*** significance at 1%, ** significance at 5%, * significance at 10%.

It is observed from table 4.3.5.1.13, that in overall, for Private Warehouses the independent variables Working Capital, Warehousing Cost, Invested Capital, Number of Employees, Wages of Workers and Inventory were significant at 1 per cent. It reveals that unit increase Working Capital, Warehousing Cost, Invested Capital, Number of Employees, Wages of Workers and Inventory were significant will increase the storage income cent per cent. The mean efficiency in Private warehouses is about 51 per cent which inculcate that 49 per cent of the above inputs were not efficiently utilised in overall.

Table No. 4.3.7 Year Wise Technical, Economic and Allocative Efficiencies in MSWC warehouses

Sr. No.	Year	T.E.	E.E.	A.E.
1	2001	0.54	0.38	0.70
2	2002	0.63	0.46	0.73
3	2003	0.55	0.45	0.81
4	2004	0.56	0.42	0.75
5	2005	0.56	0.41	0.74
6	2006	0.53	0.41	0.77
7	2007	0.58	0.51	0.89
8	2008	0.57	0.42	0.74
9	2009	0.57	0.47	0.82
10	2010	0.98	0.62	0.62
11	2011	0.99	0.63	0.63
12	2012	0.58	0.43	0.74
	Overall	0.64	0.47	0.75

The maximum technical efficiency was 99 per cent in the year 2011 and the minimum technical efficiency was 53 per cent in the year 2006. The maximum economic efficiency was 47 per cent in the year 2009 and the minimum economic efficiency was 41 per cent in the year 2005 and 2006. The maximum allocative efficiency was 89 per cent in the year 2007 and the minimum allocative efficiency was 62 per cent in the year 2010 in case of MSWC warehouses respectively

Table No. 4.3.8 Year Wise Technical, Economic and Allocative Efficiencies in Private warehouses

Sr. No.	Year	T.E.	E.E.	A.E.
1	2001	0.49	0.41	0.84
2	2002	0.98	0.78	0.80
3	2003	0.68	0.42	0.62
4	2004	0.96	0.76	0.76
5	2005	0.97	0.72	0.72
6	2006	0.99	0.61	0.62
7	2007	0.66	0.58	0.87
8	2008	0.57	0.45	0.79
9	2009	0.99	0.79	0.80
10	2010	0.58	0.45	0.77
11	2011	0.57	0.50	0.88
12	2012	0.53	0.43	0.80
	Overall	0.51	0.58	0.77

The maximum technical efficiency was 99 per cent in the year 2009 and the minimum technical efficiency was 53 per cent in the year 2012. The maximum economic efficiency was 79 per cent in the year 2009 and the minimum economic efficiency was 41 per cent in the year 2001. The maximum allocative efficiency was 84 per cent in the year 2001 and the minimum allocative efficiency was 62 per cent in the year 2003 and 2006 in case of Private warehouses respectively.

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