An Empirical Study of E-commerce Practices of Indian Organisations

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E-commerce has become the latest buzz word in recent times. Organisations, large or small, new or old, offering consumer or industrial products, are striving to switch to the potent e-commerce technology. The writing on the wall is clear that if the business organisations have to thrive in this age of globalization and information explosion, they have to embrace judicious use of e-commerce applications.

The study of e-commerce related practices of some large, reputed Indian organisations throws interesting results about their extent of adoption. The age of the organisation has been found to have an impact on the level of e-commerce practices score of the organization leading to the fact that relatively younger organizations have been more adept at implementation of e-commerce practices.

Key Words: *e-commerce, e-marketing, Organisation's age, Old and new organizations, e-commerce related practices score (ECOMPS)*

1. INTRODUCTION

In the era of information and globalization, the world has been shrinking due to proliferation of e-commerce applications throughout the world. On the one hand e-commerce platforms are acting as information carriers, on the other, they are facilitating disintermediations among the trading partners all over the world (Kotler, 2008).

International Trade Administration defines e-commerce as an activity that utilizes some form of electronic communication for exchange, advertisement, distribution and payment for goods and services. WTO defines e-commerce as a commercial process that includes production, distribution, marketing, sale or delivery of goods and services through electronic means.

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An important corollary of e-commerce, e-marketing is defined as a company's efforts to inform, communicate, promote and sell its products and services over the Internet.

This empirical paper attempts to trace the evolution of e-commerce in India, measure the extent of adoption of e-commerce practices in Indian organisations. Further, it seeks to assess the impact of organisation's age on its level of e-commerce practices and finally, suggest some measures for improving the efficacy of the e-commerce practices.

India is poised to become an IT superpower. **Saxena and Bhatt (2000)** are optimistic that the growth in the telecom sector augurs e-commerce applications. According to **Chopra (2001),** internet subscribers in the country increased exponentially from 2.6 million in 2001 to 21.6 million by 2005. Convergence of technology has led to increased use of m-commerce which is yet in a nascent stage in India **(Kumar & Jacqueline, 2005).**

Kalakota and Whinston (2003) explained about the different types of e-commerce applications as well as information interactions which are taking place among the channel partners. The same is exhibited in figure 1.

Figure 1: **Different types of e-commerce applications**

FIG. 1.3
DIFFERENT TYPES OF ELECTRONIC COMMERCE APPLICATIONS
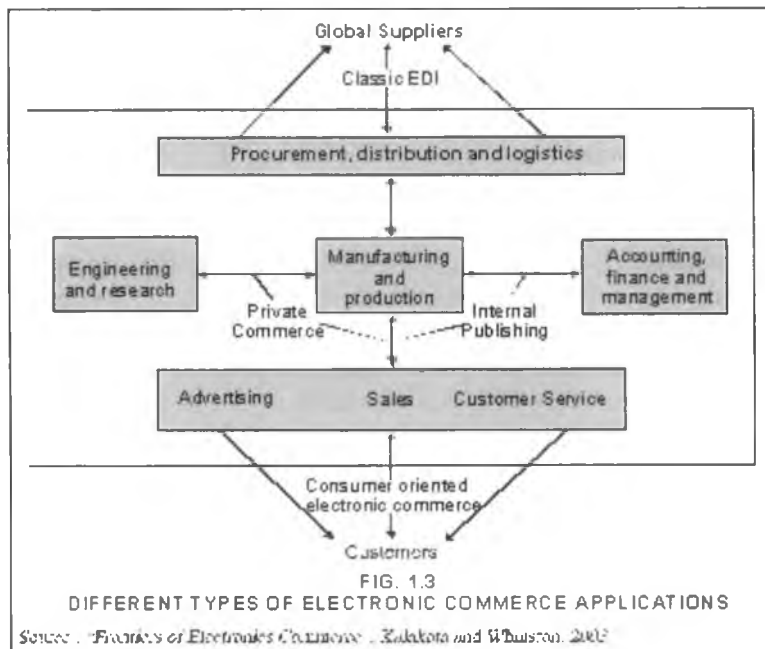
Source: Kalakota & Whinston(2003), "Frontiers of electronic commerce"

2.   REVIEW OF LITERATURE

The subject being related to the new age economy, a lot is being talked about it everywhere but hardly anything exists pertaining to the practices of Indian organisations. According to **Saxena & Bhatt (2000),** trade and commerce through electronic transmission demand telecom facility. They forecasted e-commerce share in the world and Asian Markets by 2010 at $5663b and $987b respectively. **Chopra (2001)** has discussed about various government initiatives such as privatizing Internet Service Providers, under-sea fiber optic cabling, establishment of cyber regulatory authority and cable Internet through T.V. etc. **K. Chakravarthi (2002)** has emphasized productive use of IT to automate routine tasks and to deliver value in terms of cost, quality, service and delivery. **Kotler (2004)** has explained about four specific drivers of modern world economy viz. digitalization & connectivity; disintermediation & reintermediation; customization as well as customerization and industry convergence.

Mehta and Shah (2001) discussed the growth of e-commerce and its advantage to small business firms further more discussed are the tools for the trade and strategies for e-commerce. **Serafini (2002)** found that there are four recurring themes viz. awareness development, workforce development, infrastructure development and financial limitations for e-business implementation for rural manufacturers. **Liuying (2004)** confirmed that organisational characteristics influence the e-commerce adoption level. **O' leary (2004)** in an attempt to understand the managerial implications of success and failure of an e-business found seven important factors including management, marketing, market and finance related factors.

Cohn (2004) maintained that internet as a sales tool will always increase. **Marks (2003)** suggested that traditional off-line promotion should be integrated with on-line marketing to simultaneously achieve the objectives of building brand awareness and personalization. **Rao S (2004)** examined consumer concerns of buying on-line, such as ethical and legal issues. **Sakkthivel (2004)** has outlined the impact on global commerce. **Orlando (2004)** has opined that many on-line businesses commit mistakes while promoting their on-line business by focusing only on on-line promotions forgetting traditional methods of selling.

Kumar & Jacqueline (2005) have shared about various m-commerce applications like mobile shopping, advertising and content providing etc. A U.S. consulting firm's report affirms that there were 1 b internet connections in 2005 worldwide. The U.S. is leading the tally by 200 million Internet connections, China is at second and India is at the fourth place.

According to **Corbin (2007)** financial institutions continue to explore new models for conducting their business in the on-line environment. Celent, a consulting firm has predicted that by 2010 mobile banking will attain a critical mass of approx. 30% customers.

There will be an estimated 71.6 million internet users in India by 2011 representing 6.0% of the population. B2C e-commerce sales will reach $5.66 billion in India by 2011, according to e-marketer. Future Bazaar is currently India's largest online retailer. E-commerce transactions, which are currently growing at the rate of 30% to 40% in India, are expected to reach $ 100 billion in 2008, according to CEO of the B2B Portal Trade in India.

3.   RESEARCH METHODOLOGY

The study has used exploratory research design followed by causal study. The main objective is to take stock of e-commerce related practices in a cross section of Indian organisations. A sample of 24 leading organisations having marketing operations or production units in Rajasthan were selected. Organisations existing before 1980 were termed as relatively 'Old' as against born after 1980 termed as relatively 'New' organisations. By this definition, the sample set comprised 9 new and 15 old organisations.

An instrument containing 35 statements pertaining to seven critical factors was developed on the basis of intensive literature survey to measure the extent of adoption of e-commerce practices and these statements were rated on 4 point interval rating scale. The reliability of the instrument was tested using Chronbach (a) coefficient whose value was found to be 0.7. The validity of the instrument was tested using content validity method.

The instrument was administered to the senior managers of the selected respondent organisations. The data was analyzed for the influence of organisation's age on their e-commerce related practices. **E-commerce Related Practices Score** *(ECOMPS)* was computed on the basis of e-com related factors indicated by the respondents. Higher score corresponds with high level of e-commerce practices of the organisation.

4.   ANALYSIS & RESULTS

ECOMPS was computed for the sample 24 organisations. The frequency distribution of the ECOMPS is shown in the table 1 below. Mean ECOMPS stood at 98.79 and mode at 118.2. The median value 105.5 was chosen as a measure of central tendency. 58.32 percent

organisations having ECOMPS of more than 100, exhibiting high level of e-commerce practices.

Table 1: **Frequency Distribution of ECOMPS**

S.No.	ECOMPS	Organisations	
		Number	Percent
1	60 – 69	2	8.33
2	70 – 79	4	16.67
3	80 – 89	2	8.33
4	90 – 99	2	8.33
5	100-109	7	29.16
6	110 – 119	7	29.16
	Total	**24**	**100**

As an evaluation of the impact of e-commerce related practices on overall organisational growth, the value of 'r' (Karl parson's correlation coefficient) at +0.193 (as in table 2 below) indicates a positive correlation, though not quite significant.

Table 2: **Test of significance of coefficient of co-relation**

Factor	Value of 'r'	Value of test statistics (t)	Remarks
ECOMPS and Effectiveness of organisation's e-commerce practices	+ 0.193	0.922	Coefficient of correlation is not significant

The table 3 below shows the mean scores of the seven critical factors facilitating the growth of e-com practices. Among various facilitating factors the role of top Management, organisational structure and infrastructural support and ranked high.

Table 3: **Ranking of factors for e-commerce related practices**

Critical Factor	Mean Scores	Rank
Role of Top Management	2.743	I
Organisation Structure	2.556	III
Infrastructure Support	2.57	II
Competitive Advantage	2.38	V
Employee Participation	2.48	IV
CR Management	2.31	VI
E-Marketing Practices	2.18	VII

Whether the organisational age influenced the e-commerce related practices, a cause and effect analysis was carried out using the following null hypothesis:

$H_0 1$: The new and old organisation do not differ significantly with respect to e-commerce related practices in aggregate.

Table 4. **Test of Difference between Means of new and old organisations' e-commerce practices**

Null Hypothesis Ho	Test	Value	Degree of Freedom	Result at Level of Significant	
				@ 5%	@ 1%
Ho1	t	3.05	22	rejected	rejected

For two-tailed test: tabulated value of $t_{22\ (0.025)} = 2.07$

$t_{22\ (0.005)} = 2.82$

The result in table 4 shows that the new and old organisations differ significantly with regards to e-commerce practices in aggregate. Further, to explore the relationship between age and e-commerce practices, following hypothesis was formulated.

$H_0 2$: There is no relationship between new and old organisations and their e-commerce practices.

r1 = Coefficient of correlation between age of the organisation and E-commerce Practices Score (ECOMPS) (r1 = - 0.113). (see table 5)

Table 5: **Test of correlation between age & ECOMPS**

Factor Combination	Computed Value of r	Test value of t at d.o.f. 22	Result at level of significance	
			@ 5%	@ 1%
Age & ECOMPS	-0.113	2.9	Significant (rejected)	

Since there is significant relationship found between the organisation' age and ECOMPS, the null hypothesis is rejected.

5.   FINDINGS & DISCUSSION

There has been higher level of e-commerce adoption in the studied Indian organisations. Organisational factors like the role of top management, infrastructure support and organisational structure played a primary role. Further, new and old organisations differed significantly with regard to e-commerce practices in aggregate and there was significant relationship found between the organisation's age and its   ECOMPS.

The new and old organisations do differ significantly with regards to their e-commerce related practices in aggregate at both 5% and 1% significance level. Further, the correlation between organisational age and e-commerce practice score is negative but the coefficient of correlation is significant at 5% and 1% level of significance. The results might be attributed to the sample selection since mostly big organisations, in their initial stage of e-commerce implementation were studied. The new organisations tend to embrace latest technological know-how and are relatively more adaptive to the environmental changes, including the e-commerce practices.

Though the old organisations with their sound base of experienced management, strategic leadership and resources are also having good e-commerce practices, the negative correlation shows that new organisations are slighting ahead of them with regards to overall e-commerce practices. This is evident from many multinational organisations entering India with advanced stages of e-commerce implementation.

Internet is changing the way business is done. Amidst changing business practices, organisations have to adopt e-business, though at a pace in consonance with their own needs. Even the organisations with high level of e-commerce adoption are advised to go in for advanced stage of CRM and e-marketing implementation rather than remaining in the initial stage of e-commerce. They should initiate appropriate measures for increased employee participation with top management's support and monitoring. Cultural changes are required for a smooth transition from information control to information sharing.

6.   CONCLUDING REMARKS

There is a growing realisation among business organisations that they cannot succeed without making optimal use of e-commerce applications. With the largest English speaking youth population & excellent technical education coupled with expertise in software development, India is at the threshold of becoming economic superpower of the world by riding the technological bandwagon. The organisations need to revive their strategy

towards development of e-commerce. The older organisations need to work on employee skill upgradation, CRM and e-marketing practices whereas the new generation business organisations are expected to employ more sophisticated state-of-the-art IT tools to reap the benefits of the e-commerce.

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Price Risk in Turmeric Trade: A Study in Erode Market

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Farming always has been a risky business and in all likelihood always will be. The changing environmental factors are creating much uncertainty and high risks. The changing outlook of risk management focuses on various risks faced in farming. Turmeric farming is one such trade that is vulnerable to many kinds of risks. This study focuses on the risk factors prevailing in the turmeric trade. Erode being the economic zone for turmeric; it is taken up to study the extent and the causes of risk. Instability of turmeric prices has always been a major concern of the producers, processors, traders, as well as the consumers. Erode farmers' direct exposure to price fluctuations; for instance, makes it too risky for many farmers to invest in otherwise profitable activities. Any farming has an added risk because of the seasonal factors involved in production. This seasonality has a larger bearing on the price of the turmeric cultivated by the farmers in Erode. The price risk refers to the probability of adverse movements in prices of the turmeric produce.

Introduction

Turmeric is a spice crop which is widely purchased and consumed by Indian households in processed forms viz., powder, cream etc. Therefore it requires a vast net work of marketing facilities for assembling, processing, packaging and retailing. Domestic market for turmeric has well developed to meet these needs. There are four important assembling markets for turmeric in Tamilnadu. They are at Erode, Coimbatore, Salem and Karur. However, nearly 80 percent of production in the state is sold in Erode market and the arrivals at other markets are limited as such. The producers of turmeric have four options to sell their produce (i.e.) through (a) commission agents, (b) regulated market or (c) co-operative marketing society and (d) Gobi Co-operative marketing society

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Statement of the Problem

Erode is the leading market for turmeric in Tamilnadu with a contribution of 80% to the total production in the state. Hence Erode market is taken for study. It is an assembling market where turmeric producers (farmers) are on the supply side, while primary whole sale traders are on the demand side. Three marketing agents viz., commission agents, regulated market and the two cooperative marketing societies facilitate trade in turmeric between producers and the primary whole sale traders. This is the system of turmeric trade in Erode. Hence it is studied for the risk arising from variation in whole sale price of turmeric.

Objectives

To study the price risk in turmeric for primary producers - farmers

Hypothesis

Seasonal and cyclical variations are the causes of the price risk in turmeric.

Limitations

This study deals only with the business risk of turmeric trade, the other aspects of the trade are not included within the purview of the study. The time series data for the present study is limited to a period of 20 years from 1985 to 2005 due to time and resource constraints. The area of study is confined to Erode market, which comes under special economic zone and hence the problems listed may not be relevant for other markets

Methodology

Secondary data were collected to study temporal variation in prices of turmeric transacted in Erode market. Secondary data for the study were obtained from Regulated Market, Co-operative Marketing Societies, and Turmeric Commission Agent's Association. The data were collected for the period from 1986 January to 2005 December.

Tools of Analysis

Time series Analysis

The time-series analysis of turmeric prices in Erode market is done, for the four types of agents who purchased turmeric from farmers, for its components: trend, seasonal variations, cyclic variations and random variations.

Causes of price variability can be identified in the Regulated market, Co-operative marketing societies and Commission agents using the time series data, which are considered to be the resultant of the combined impact of one or more of the following components: trend, seasonal variations, cyclic variations and random variations.

Seasonal Variation Index

The seasonal variations were studied with the seasonal indices, estimated by the ratio-to-moving average method for the monthly price of turmeric in the regulated market, commission agents and cooperative marketing societies, with data for the period of 10 years from1996 to 2005. The seasonal indices are presented in Table 3.

Table 3 - Seasonal Variation Indices of Turmeric Price

S.No	Months	RM	CA	ECO	GCO
1.	January	98.9	98.7	98.8	98.6
2	February	96.5	97.6	96.9	96.6
3	March	96.6	98.4	96.6	98
4	April	98.9	100.1	101.5	101
5	May	96.7	96.1	96.0	96
6	June	97.7	100.4	97.1	97
7	July	96.8	99.9	96.6	96.6
8	August	100.0	101.6	99.9	99.8
9	September	102.2	102.5	101.8	101.9
10	October	105.5	100.3	105.2	105
11	November	103.5	101.8	103.1	103
12	December	106.6	102.7	106.5	106.5

Note: RM   -   *Regulated Market*
        CA   -   *Commission Agent*
        ECO   -   *Erode Cooperative Marketing Society*
        GCO   -   *Gobi Cooperative Marketing Society*

It is observed from the table above, that the estimated seasonal indices of the three market agents, viz., regulated market, commission agents and cooperative marketing societies have similar pattern. In the regulated market the price index of turmeric was lowest at 96.5 in the month of February and the highest of 106.6 in the month of December. With commission agents the price index was 96.1 in May and 102.7 in December. It can be seen from the table that the price index of Erode and Gobi cooperative marketing

societies were 96 in the month of May and the highest of 106.5 in the month of December.

Thus, it can be inferred that the farmers received highest price during the months of August to December from all the three market agents. On the other hand, the lowest price was recorded in the months of February and May and attributed to the heavy arrivals immediately after harvest into the market yard. During off-season (August to December) the prices were normally high.

However in all the cases the indices had not moved beyond six points on either side of 100, showing that though there was a seasonal variation in prices of turmeric it had a small range and it was largely in response to market supply. Turmeric could be stored for nearly a year with only a small loss of weight due to driage. Therefore farmers stored it in expectation of better price that would also cover storage cost. Therefore seasonality in supply to the market could be reduced by storage to have lesser variation in price. This was, in a way, a method of risk management by farmers in the price received by them.

The seasonal variation in prices of turmeric is within the year variation and it determines the annual average price for the year. As the seasonal variation is observed to have a narrow range its effect on annual average price of turmeric is small. It is not however a component of the time series of annual data. Therefore annual data has only three components viz., trend, cyclical variation and irregular (random) variation (i.e.) $T+C+I$, these components are studied next.

Trend

Trend analysis would show long-term movements of price in the regulated market, commission agents, and cooperative marketing societies. A linear trend equation was specified and estimated by the ordinary least squares (OLS) method for the annual average price that prevailed in the market during the period of 20 years from 1986 to 2005.

Price in Regulated Market

The variation in annual average price of turmeric in the regulated market at Erode is shown below

Table 4. **Variation in Price of Turmeric in Regulated Market**

(Rs. per quintal)

Range		Mean	SD	CV (%)
Min	Max			
710	3119	1816.15	834.85105	45.9681

The high value of CV is a sign of price risk, however a part of it may be due to trend and the rest may be attributed to the cyclical and random variations, both being beyond the control of traders and therefore, sources of risk to them. So the trend is first studied.

The trend equation estimated for the annual average price of turmeric in Erode regulated market is presented in Table 5

Table 5. **Trend in Price of Turmeric in Regulated Market**

Variable	Constant β_0	Trend Coefficient β_1	R^2	F	D
Price of Turmeric (Rs/Quintal)	653.12	110.12	0.633**	31.00**	1.195
(t)	(2.74)*	(5.57)**			

Note: * - *Significant at 5% level* ** - *Significant at 1% level.* n = 20.
Price refers to annual average price in Rupees per quintal.
d - Durbin Watson test statistics.
Estimated Trend Equation: $P_{RM} = 653.12 + 110.12\ t$

Table 6. **Analysis of Variance**

Source	DF	SS	MS	F	Sig.
Regression	1	8158758.8	8158758.8	31.00	0.000
Residual	18	4737121.7	263173.4		
Total	**19**	**12895881**	**(29.95)**		

The variance of the residual is large and it is 29.95 percent of variation due to trend, showing that the price risk is not small.

It could be observed from the table above, that the estimated linear trend equation had R^2 a large value of 0.633 and F statistics (31.00) that are statistically significant at 1% level. The trend could explain nearly 63 percent of variation in the annual average price of turmeric paid by the regulated market to the farmers. The coefficient ($\hat{a}_1$) of trend variable (t) has a positive sign and its value (110.12) is statistically significant at 1% level. It means, that over the years, the price of turmeric paid by the regulated market to the farmers increased, at an annual average of Rs110 per quintal. The Durban-Watson test statistics (d), with a value of 1.195 indicated the absence of the problem of auto correlation in time series of price of turmeric studied ($0 < d = 1.195 < d_1$)

Price of Commission Agents

The variation in annual average price of turmeric in commission agent is shown below in Table 7

Table 7. **Variation in Price of Turmeric in Commission Agent**

(Rs. per quintal)

Range		Mean	SD	CV (%)
Min	Max			
710	3277	1816.95	834.63459	45.9360

During the period (1986-2005) the price has varied from Rs. 710 per quintal to Rs. 3277 per quintal, with wide inter year variations and the coefficient of variation is 45.94 percent – a simple measure of risk. Part of the variation is due to the rise in general price level and the rest may be attributed to the effect of demand and supply forces in the market. More specific measure of risk is discussed later.

The trend estimated for the annual average price of commission agents is presented in Table 8.

Table 8. Trend in Price of Turmeric in Commission Agent

Variable	Constant β_0	Trend Coefficient β_1	R^2	F	d
Price of Turmeric (Rs/Quintal)	659.01	110.09	0.609**	28.03**	1.152
(t)	(2.65)*	(5.19)**			

Note: * - *Significant at 5% level*   ** - *Significant at 1% level.* $n = 20.$
Price refers to annual average price in Rupees per quintal.
d - *Durbin Watson test statistics.*
Estimated Trend Equation: $P_{CA} = 659.01 + 110.09$

Table 9. Analysis of Variance

Source	DF	SS	MS	F	Sig.
Regression	1	8059595.3	8059595.3	28.03	0.000
Residual	18	5176087.6	287560.4		
Total	**19**	**13235683**	**(35.55)**		

The variance of the residual is 35.55 percent of that due to trend. This is very high and shows that the price risk is high.

As seen in the table above, the estimated linear trend equation is valid to draw inference as, R^2 has a large value of 0.609 and it is statistically significant at 1% level as shown by the value of F statistics (28.03). Therefore the estimated linear trend equation would explain nearly 61 percent of variation in the annual average price of turmeric paid by the commission agents to the farmers. The coefficient (β_1) of trend variable (t) has a positive sign and its value (110.09) is statistically significant at 1% level. It means that the price of turmeric paid by the commission agents increases on an average at Rs110 per quintal – an uptrend that is significant. The Durban-Watson test statistics (d), with a value of 1.152 indicates the absence of the problem of auto-correlation in time series of price of turmeric studied $(0 < \hat{d} = 1.202 < d_1)$.

Price of Erode Cooperative Marketing Society

The variation in annual average price of turmeric in Erode cooperative marketing society (ECO) is given below in Table 10

Table 10. **Variation in Price of Turmeric in ECO**

(Rs. per quintal)

Range		Mean	SD	CV (%)
Min	Max			
726	3300	1728.05	834.63459	45.3794

In the Erode cooperative marketing society the farmers have received, for turmeric sold by them, price in the range of Rs.726 to Rs.3300 per quintal, the average being Rs.1728 per quintal. However, the SD is also large and so the CV is 45.38 percent – revealing that the price risk of farmers is not small with this market also.

The linear trend equation estimated for the annual average price of turmeric in Erode cooperative marketing society is presented in Table 11 below.

Table 11. **Trend in Price of Turmeric in ECO**

Variable	Constant β_0	Trend Coefficient β_1	R^2	F	d
Price of Turmeric (Rs/Quintal)	614.11	106.09	0.640˙˙	32.08˙˙	1.239
(t)	(2.74)˙	(5.67)˙˙			

Table 12. **Analysis of Variance**

Source	DF	SS	MS	F	Sig.
Regression	1	7484559	7484559	32.08	0.000
Residual	18	4199237.6	233291		
Total	**19**	**11683797**	**(28.24)**		

The value of residual is large and it is 28.24 percent of the variation of trend, showing that the price risk is not small.

The table above explains that the estimated linear trend equation has a good fit as R^2 has a large value of 0.640 and it is statistically significant at 1% level. The value of F statistics (32.08) is also large. Therefore the estimated linear trend equation would explain nearly 64 percent of variation in the annual average price of turmeric paid by the Erode cooperative marketing society to the farmers. The coefficient (β_1) of trend variable (t) has a positive sign and its value (106.09) is statistically significant at 1% level. This shows that there is an upward movement in the price of turmeric paid by the Erode cooperative marketing society and it increases on an average at Rs106 per quintal. The Durban-Watson test statistics (d), with a value of 1.239 indicates the absence of the problem of auto correlation in time series of price of turmeric studied (0 < =1.239< d_L)

Price in Gobi Cooperative Marketing Society

The variation in annual average price of turmeric in Gobi cooperative marketing society (GCO) is given in Table 13.

Table13. **Variation in Price of Turmeric in GCO**

(Rs. per quintal)

Range		Mean	SD	CV (%)
Min	**Max**			
717	3300	1819.85	850.75529	46.7486

In the Gobi cooperative marketing society the farmers have received price in the range of Rs.717 to Rs.3300 per quintal, for turmeric sold by them. The average being Rs.1819 per quintal, the SD is also large and so

the CV is 46.75 percent – revealing that the price risk of farmers is not small in this source of marketing.

The linear trend equation estimated for the annual average price of turmeric in Gobi cooperative marketing society is presented in Table 14 below

Table 14. **Trend in Price of Turmeric in GCO**

Variable	Constant β_0	Trend Coefficient β_1	R^2	F	D
Price of Turmeric (Rs/Quintal)	668.47	109.65	0.581**	25.00**	1.126
(t)	(2.55)*	(5.00)**			

Note: * - Significant at 5% level
　　** - Significant at 1% level.
　　n = 20.
　　Price refers to annual average price in Rupees per quintal.
　　d - Durbin Watson test statistics.
　　Estimated Trend Equation: P_{GCO} = 668.47 + 109.65 t

Table 15. **Analysis of Variance**

Source	DF	SS	MS	F	Sig.
Regression	1	7996089.2	7996089.2	25.00	0.000
Residual	18	4199237.6	319767		
Total	**19**	**13751907**	**(42.41)**		

The residual variance is 42.41 percent of the variation due to trend. This shows that the price risk is high.

As noted in the table above the estimated linear trend equation is valid to draw inference as the value of R^2 is large (0.581) and it is statistically significant at 1% level as shown by the value of F statistics (25). It would explain nearly 58 percent of variation in the annual average price of turmeric paid by the Gobi cooperative marketing society to the farmers. The coefficient (β_1) of trend variable (t) has a positive sign and its value (109.65) is statistically significant at 1% level. This shows that there is an upward trend in the price of turmeric paid by the Gobi cooperative marketing society and the price increases on an average at Rs106 per quintal per year.

The Durban-Watson test statistics (d), with a value of 1.126 indicates the absence of the problem of auto correlation in time series of price of turmeric studied (0 < =1.126 <d_L).

It is observed from the trend analysis of the average annual price of turmeric of the four market intermediaries viz., regulated market, commission agent, Erode cooperative marketing society and Gobi cooperative marketing that there is an upward trend in the movement of price from the year 1986 to 2005. The large value of CV seen with all the four marketing agents reveals that the price risk is high. The cyclical and irregular variations are also studied to understand the deviation from the trend prices.

Cyclical Variation

In the annual price for turmeric a wide variation is seen and it can be attributed to the trend (T), cyclical (C) and irregular variation (I). The trend equations estimated for the four marketing agents showed that it would explain only around 60 percent of total variation in prices and the remaining variation is attributed to the residual – a measure of random variation in prices. This variation is beyond the control of the marketing agents and it includes also the cyclical variations (C). The cyclical variation is studied with the help of cyclical index. The cyclical indices for the annual price of turmeric for the four market agents are presented in Table 16.

The index of cyclical variation changes its direction approximately once in three years in all the four cases revealing a three year cycle in the annual average prices of turmeric in Erode market. This variation is understood by the buyers of turmeric and adjusted in the price offered to the farmers and it is a source of price risk to the farmers.

Table 16. **Indices of Cyclical Variation in Turmeric Prices**

Year	RM	CA	ECO	GCO
1986	92.95	92.32	100.81	92.15
1987	109.10	112.00	118.72	110.20
1988	84.23	83.80	90.74	85.12
1989	64.77	64.58	70.20	65.58
1990	80.04	79.95	82.56	78.98
1991	136.60	136.40	145.52	134.70
1992	156.70	156.50	167.24	158.70
1993	97.13	97.09	102.06	95.62
1994	60.91	60.92	63.42	57.57
1995	65.09	67.56	63.76	67.37
1996	111.00	111.10	95.00	110.90
1997	129.90	130.00	102.48	136.00
1998	138.50	138.70	112.38	143.30

1999	115.80	115.90	117.13	114.00
2000	66.97	67.09	69.06	65.28
2001	64.08	61.43	65.11	59.43
2002	107.40	92.59	98.11	92.99
2003	117.80	124.10	130.76	124.90
2004	100.50	112.40	118.03	111.40
2005	92.39	88.05	93.57	88.07
Mean	99.59	99.63	100.33	99.61
SD	27.99	28.57	27.95	29.75
CV(%)	28.11	28.67	27.86	29.87

Note: RM - Regulated Market
CA - Commission Agents
ECO - Erode Cooperative Marketing Society
GCO - Gobi Cooperative Marketing Society

As seen in the table, the cyclical variation is the deviation from the trend, both above and below the trend and the index measures the actual (observed) prices as percentage to the estimated trend value for the year. Therefore the mean of these indices for the years studied, is 100 as seen in the table above (except for rounding of error). The SD and CV of the cyclical indices are presented in the last two rows of the table. The CV is around 28 percent for three agents and 30 percent for Gobi cooperative marketing society. This knowledge is used to decompose total (SS) in turmeric prices into its components viz., T,C and I.

Components of Annual Price

The total sum of squares (TSS) of annual prices of turmeric in Erode market is decomposed into (i) RSS (regression sum of square or variation due to trend), (ii) CSS (cyclical sum of squares) and the balance is a measure of residual (random or irregular) sum of squares. The estimates are presented in Table 17.

Components of Annual Price

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Table 17. Sum of Squares of components of Annual Price of Turmeric

Turmeric Price at	Total SS	Trend SS	Cyclical SS	Residual SS
RM	12895881	8158759(63.27)	2293427(17.78)	2443695(18.95)
CA	13235683	8059595(60.89)	2310686(17.46)	2865402(21.65)
ECO	11683797	7484859(64.06)	2085282(17.85)	2113956(18.09)
GCO	13751907	7996089(58.14)	2388432(17.37)	3367385(24.49)

Note: RM - Regulated Market   ECO - Erode Cooperative Marketing Society
         CA - Commission Agents   GCO - Gobi Cooperative Marketing Society
         Figures within ( ) are percentages to the total SS.
         Prices in Rs. per Qunital.

It is observed from the above table that the residual sum of squares is the measure of the irregular variation in the turmeric price of the three market agents. For the regulated market it is around 19 percent, for commission agents it is around 22 percent, for Erode cooperative marketing society it is around 18 percent and for Gobi cooperative marketing society it is 25 percent. This explains the source of price risk to the farmers, because the traders are able to pass it on to the sellers through adjustment in prices.

In the total variation in the annual price of turmeric, the trend (T) accounts for 58 to 64 percent, while cyclical variation (C) causes 17 percent of the variation, irregular variation (I) is 19 to 24 percent. Both cyclical variation and irregular variation are beyond the control of the traders and they have to bear it. An uptrend in the price is a gain, but only a part of it is passed on to the farmers, depending upon the market power.

The sources of price variability were identified from the annual average price of the three market agents - regulated market, commission agents and co-operative marketing societies using the time series data. The price risks for the farmers were observed to be resultant of the combined impact of the components: trend, cyclic variations and random variations. In practice cyclical variation and irregular variation are observed together when the time series is adjusted for the trend and the residual (y-w) is derived and it is taken as a measure of price risk in turmeric trade.

Salient Findings

Salient findings of the result of analysis are presented below briefly.
- Seasonal indices of the four market agents, viz., regulated market, commission agents and cooperative marketing societies exhibited similar pattern. Farmers received highest price during the months of August to December with all the three market agents and lowest price was recorded in the months of February and May. This is due to the heavy

arrivals immediately after harvest into the market. Seasonal variation in prices of turmeric had a small range and it was largely in response to market supply, since turmeric could be stored for a longer period without much of cost incurred for storage. Therefore seasonality in supply to the market could be reduced by storage to have lesser variation in price. This was in a way, a method of risk management by farmers in the price received by them.

•   The trend in turmeric price in Erode showed a positive and significant upward movement in price of turmeric – for all the four categories of buyers.

•   The index of cyclical variation changed its direction approximately once in three years in all the four cases revealing a three year cycle in the annual average prices of turmeric in Erode market. This variation is understood by the buyers of turmeric and adjusted in the price offered to the farmers and it is a source of price risk to the farmers.

•   The irregular variation as measured by the variance of the residuals of the linear trend equation was in the range of 18 percent to 25 percent of total variation in price of turmeric. This explained the source of price risk to the farmers. The price risks for the farmers were observed to be a combined impact of the components: trend, cyclic variations and random variations.

Conclusion

The above summary of salient findings and the empirical verification of the hypotheses have helped drawing specific conclusion. Time series analysis of annual data on price of turmeric shows that the cyclical and irregular variances are major causes of the price risk.

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