9.1 RECOMMENDATIONS

The commodities are highly volatile and have been shown to exhibit varying volatility.

9.1.1 COMMODITY DERIVATIVE MARKETS

This research concludes that the commodity derivative markets are not efficient, at least in India. These conclusions are drawn from a study of four products but could be easily generalized since the markets (both spot and derivative) for other products are unlikely to be different in characteristics.

The results of the study are in conformity with several studies abroad which conclude that in underdeveloped markets derivative exchanges are likely to remain inefficient. If so, the government should try to improve efficiency by inviting large institutions to participate in the exchanges. This could help better price discovery.

Suggestions:
1. Creation of national spot exchange in line of US commodity market where department of agriculture announces spot price every day, besides guaranteeing quantity and quality of produce at warehouses.

2. Improving the infrastructure by increasing warehousing capacity and effective transportation system.

3. Increasing the awareness about commodity market to attract more players participation in this market. This included educating the farmers.

4. One way, which is now implemented in some way, is to allow banks and institutions to participate in commodity market. This could increase involvement of knowledgeable players who have a stake in stability and efficiency of the markets.

9.1.2 FORECASTING OF COMMODITY PRICES

An economic agent takes rationale decisions consciously or unconsciously assessing the price of the product which he produces or consumes in present period and for future periods. However, future prices are not easy to estimate and the uncertainty could result in sub optimal decisions in the present period. Forecasting commodity prices is crucial as many a production decisions are based on these estimates.

This research has produced optimal forecast techniques for two commodities: wheat, an agricultural product and tin, a metal product. ARIMA (x,x,x) is found to be a better technique than either random walk model, simple or with drift, exponential smoothing and neural network based model. Superiority of ARIMA over neural network, in fact, is a pointer to the fact that normal human brain (for which neural network may be assumed a proxy) could be helped by the man-made processes like ARIMA.

9.1.3 RAINFALL DERIVATIVE PRODUCTS

Need for insurance for farmers against the risk of uncertain rainfall is clearly established. Traditional methods have become outdated, have reduced influence or
lost their relevance, create moral hazards and result in adverse selection, and
generally have failed to deliver to many a farmer. Large number of suicides of
farmers is a cause of grave concern and points to a policy failure. Large and
extended families with different holdings are becoming extant. Urbanization creates
a portfolio of businesses for a farm family with some members employed in the city
but also results in long term loosening of family ties.

Academicians can play a role by developing new insurance products which are more
efficient and more equitable, are affordable, easy to understand and which results in
timely makeup for loss in income to farmers. This research has shown that simple
products which are affordable could be designed and offered. The cost of such
products could be small enough for farmers to buy the product. Such a product
would be more equitable as it does not discriminate against poor farmers and does
not result in adverse selection.

In the Indian context, weather derivatives would prove to be immensely beneficial,
especially to the farmers who plough non-irrigated land.

Weather derivatives, like any other exchange traded instrument, can serve the
purpose of its creation only if it is used by large number of farmers resulting in
increases in volume and decrease in upfront premium.

Instruments which work in one country may fail in another country. A customized
product is required for different crop. One can be optimistic above the success of
the product based on the empirical studies conducted in other developing countries,
and success of weather derivatives in these countries. India offers large potential for
this innovative product. The government should, in course of time, allow trading of
this product. The product can be self sustaining over a period of time. However, in
the initial phase the government could subsidize the product.

A sound regulatory framework and legal provisions must be in place. If not, this
could result in dissatisfied customers or even failure of the product.
A reinsurance market is necessary for the primary insurer to take risks.

Market development requires sustained efforts and educating the farmers. Unless this is done, such a product may only be a limited success. The key challenge is to educate the farmers about such contracts and their usage and develop a standardized model for pricing these derivatives.

Pricing of the product is of utmost importance. Calculating a fair price is a complex task. No universally accepted model exists as of the day. It is necessary to develop a sound pricing model before the product is offered. The government could commission studies under the auspices of research organizations for optimal design of the product.

**9.2 SCOPE FOR FUTURE RESEARCH**

**9.2.1 STUDY OF PRICE MOVEMENTS AND VOLATILITY**

Prices of many commodities are likely to move together since they are substitutes. The co-movement of prices has implications for economic agents, for decisions on hedging risks, for speculative profits leading to price discovery, for income distribution and welfare. An analysis is required to establish co-movement of prices, if any. Such a linkage may also be determined for domestic prices and international prices. How the prices get transmitted may also be studied.

Commodity price volatility and its linkage to economic growth in the short run and long run can be studied. Such studies in Indian context could help in policy making for commodities markets.

**9.2.2 EFFICIENCY STUDIES**

More studies for determining efficiency of Indian derivative markets are required. As derivative markets become broader and deeper, it is likely that the efficiency of
the markets will improve. Linkage between depth of the market and efficiency could also be studied.

### 9.2.3 RESEARCH ON FORECASTING COMMODITY PRICE

Since there is no established model for forecasting commodity price, an attempt can be made to determine whether there is a model which is superior to others for a group of commodities. That is, e.g., is there a model that is universally better for metals as a group.

Similar search for a specific methodology may also be undertaken for

### 9.2.4 RESEARCH ON RAINFALL DERIVATIVES

Scope for future research in this area of study is immense. The study can be extended to several other agricultural products, especially ones which are highly rainfall sensitive.

A study can focus at disaggregated regional data and design separate product for different region.

A study can consider kharif output and rabi output separately.

A single product for all the crops can also be designed, for fewer complications, if correlations are calculated and factored into.

A better index, more representative of the actual expenditure may be constructed and used for design of the derivative product.

The market may be open to world trade or may not be. The market access may even be regionally or state-wise restricted. Then its impact may be different and may be studied.

A larger welfare analysis study may be undertaken.
The product may also be designed as a tradable product and as a tradable futures contract.