# Commodity market instability and development: Issues and policies

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# Plan of presentation

- Commodity market instability: Conceptual issues
- How important is the commodity instability problem
- Causes of food commodity price volatility
- Impacts of market instability
- Price transmission
- Asymmetries in market instability
- Distortions and market instability
- Market instability an d poverty traps
- Policies to deal with price volatility
- Priorities for action by the international community to assist developing countries to deal with continuing food market volatility?

# Conceptual issues

- What matters for market participants is uncertainty, namely ex-ante unpredictability and not ex-post realized price variability
- Risk is determined by exposure to uncertainty or unpredictability
- Unpredictability not easily measured, while ex-post variability readily measured
- Impacts of volatility on DCs large at both micro and macro levels because of large dependence on primary commodities for export earnings, but also food commodities for satisfying domestic food requirements.
- Impacts large because of credit constraints at both micro and macro levels

# Issues relevant to commodity prices and volatility

- Do commodity prices have trends?
- Are shocks temporary or permanent?
- Are shocks persistent?
- Do commodity market prices comove?
- Nature of unanticipated shocks
- Volatility best measured by forward looking measures, such as conditional variance of future prices (eg. via GARCH estimates) or implied volatilities from options data

# What does the literature say

- Small negative real trends but depends on time period. Signal to noise ratio small.
- Tests of temporary or permanent trends have low power.
- Trends seem variable hence uncertain.
- Shocks and their effects on market prices exhibit persistence
- Duration of price slumps larger than that of price booms
- Severity of booms and slumps unrelated to their duration
- Probability of ending a boom or slump independent of time spent in boom or slump
- Co-movement largely absent in unrelated commodities
- Food commodity price volatility is influenced by yields, exchange rate volatility, petroleum price volatility, stock levels, export concentration, interest rate volatility, national policies
- Volatility changes over time (has volatility increased?)
- **Conclusion: Market risks and fundamentals of volatility are variable over time**

# Volatility estimates can vary widely. Estimates of implied volatilities of wheat returns in CME versus estimates using GARCH (correlation -0.03)
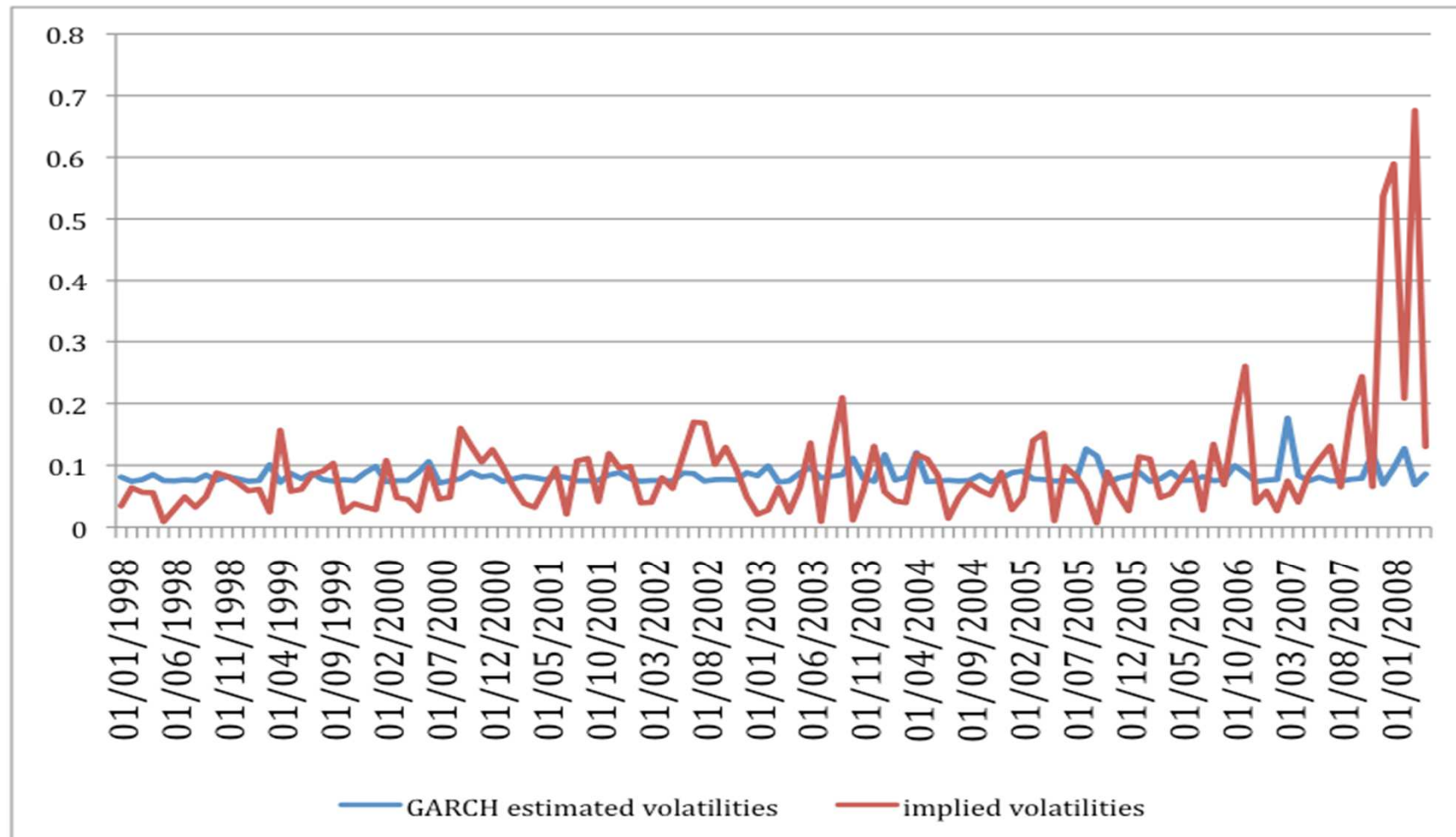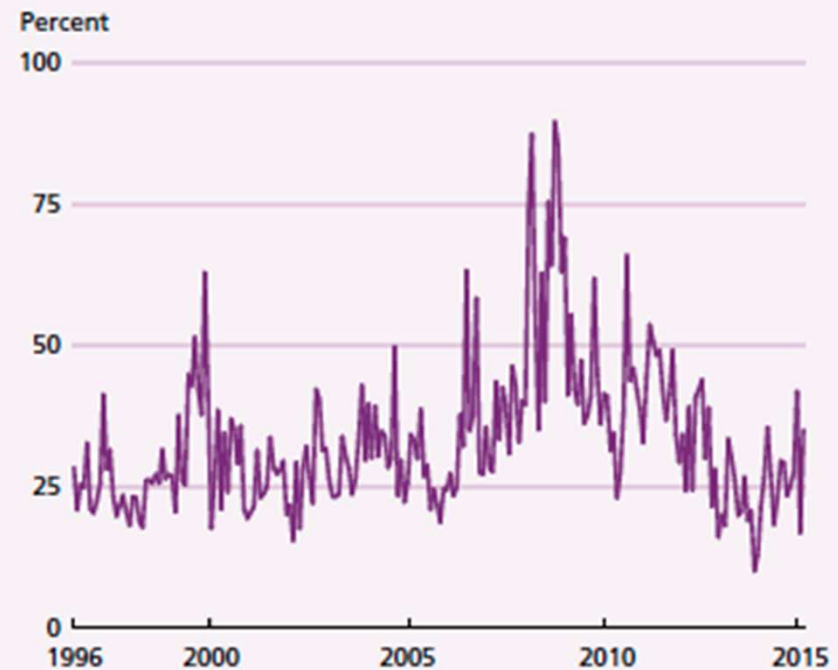
# Market volatility has declined considerably after the food crisis of 2007-8 (FAO Food outlook May 2015)



Figure 1.1: Implied wheat price volatility*

Figure 1.2: Realized wheat price volatility (Chicago No. 2 SRW Wheat)
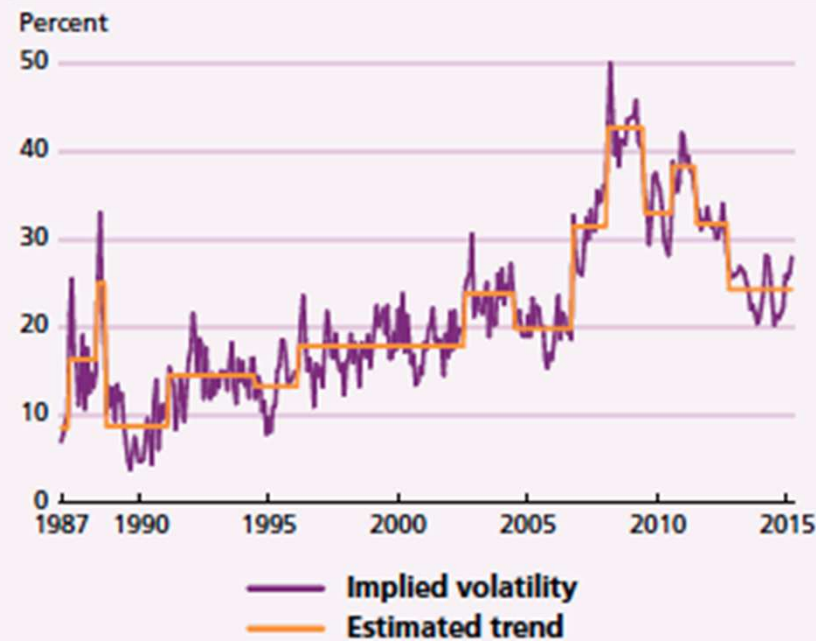
* based on Black-Scholes formula for at-the-money options with six months maturity

# How serious is the commodity market volatility problem for developing countries?

- According to UNCTAD (2014), a commodity dependent country is one where commodity exports account for 60 percent or more of merchandise export value.
- In 2012-13 e 94 developing countries which were CDDCs, up from 88 in 2009-10.
- Of these 45 were in Africa, 20 in Latin America and the Caribbean, 19 in Asia, and 10 in Oceania.
- These countries represented 71 percent of all developing countries in 2012-13.
- Sixty three developing countries were classified in 2012-13 as being extremely commodity dependent, defined as those where commodity exports accounted for more than 80 percent of total merchandise export value.
-  Of all Least Developed Countries 39 countries (or 85 percent of the group) were CDDCs in 2012-13, an increase from 37 in 2009-10.
- UNCTAD cautions that the recent increase in commodity dependence maybe the result of rising commodity prices. Between 2009-10 and 2012-13, the UNCTAD non-oil commodity price index rose by 14 percent, while crude oil prices rose by 48 percent.
- Most of these CDDCs also had very high degree of commodity export concentration, namely dependence on only a few commodities for total exports.

# Consequences of commodity market instability

- Commodity market instability and upredictability is crucial for commodity exporting countries, and this is where the commodity dependence literature has focused for most of the past 40 years.

- Food commodity dependence, expecially by LDCs, LIFDCs, and NFIDCs came to the fore with the first world food crisis of 1973-74, and recently with the food crisis of 2007-8.

- Food market instability and especially unpredictability matters a lot for food security for countries and households that are net staple food buyers. There are 62 Low Income Food Deficit Countries (LIFDCs) a FAO classification.

- Almost all LDCs are also included in the LIFDC list.

- A list of NFIDCs (Net Food Importing Developing Countries) a World Trade Organization (WTO) group, as of 2012 includes all 49 LDCs and another 31 higher income developing countries, for a total of 80 countries.

# Impacts of commodity market instability

- Proper response to a commodity shock differ depending on whether the shock affecting the country is transitory or permanent. Factors to consider are the following: (i) Does the price shock have its origins in factors external to the country, such as world markets, or in domestic production supply imbalances in the markets concerned? (ii) How transitory are the factors that have led to the price shock? (iii) What is the level of uncertainty concerning the factors that may influence the future course of prices?

- The second issue concerns the possible impacts of the price shock on the country's economy and its citizens. The impact of increasing prices on the wider economy is determined by a number of structural characteristics, such as the structure of production and food consumption, and the types and income-consumption profiles of households.

- It is important to ascertain the extent to which price signals are transmitted to the domestic markets, the identification of vulnerable population groups that can be targeted for support, as well as the agricultural sector's ability to respond to increasing prices.

- The third issue that is imperative before a country adopts specific policy measures is to ascertain and be clear about the objective of the policy. Too often policy measures are adopted with a very narrow objective, and may end up affecting negatively other areas of equally important domestic concern.

# Causes of food commodity market instability and price spikes

- **Weather and climate change** – Well known. Climate change is altering weather patterns, but its impact on extreme weather events is not clear.
- **Stock levels** - When accessible stocks are low relative to use, price volatility may be high.
- **Energy prices** - Increasing links to energy markets through both inputs such as fertilizer and transportation, and through biofuel feedstock demand, are transmitting price volatility from energy to agricultural markets.
- **Exchange rates** - By affecting domestic commodity prices, currency movements have the potential to impact food security and competitiveness around the world.
- **Growing demand** –With per capita incomes rising globally and in many poor countries expected to increase by as much as 50%, food demand is becoming more price inelastic, such that larger price rises are necessary to accommodate temporary demand increases.
- **Resource pressures** - Higher input costs, slower technology application, expansion into more marginal lands, and limits to double cropping and water for irrigation, are limiting production growth rates.
- **Trade restrictions** – Both export and import restrictions amplify price volatility in international markets.
- **Speculation** - High levels of speculative activity in futures markets may amplify price movements in the short term although there is no conclusive evidence of longer term systemic effects on volatility.
- **Short term interest rates** – interest rates, which are affected by macro developments, affect the cost of storage, and hence the level of stocks

The main causes of the recent price spikes have been rising energy prices, the depreciation of the U.S. dollar, low interest rates, and investment portfolio adjustments in favor of commodities (Headey and Fan, 2011).

# Impacts of food market instability and unpredictability on food security

**Table 1. Food expenditures of people living on less than $1.25 per day, 30 developing countries, 2001-2010**

| | All countries gross share of food | All countries gross share of total consumption | All countries net share of total consumption | Average net share in expenditure of the poor, % of total | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | India | China | Bangladesh | Pakistan | Vietnam | Uganda | Tanzania | Indonesia |
| Total | 100.0 | 60.8 | 37.0 | 59.7 | 26.2 | 26.1 | 37.8 | -15.6 | 15.2 | 33.4 | 32.7 |
| Rice (+ processed) | 22.4 | 13.9 | 8.2 | 14.7 | 5.6 | 5.0 | 1.7 | -9.3 | 0.1 | 2.8 | 2.6 |
| Other food | 15.6 | 9.7 | 7.6 | 9.9 | 7.5 | 7.7 | 4.4 | 3.5 | 1.6 | 7.9 | 18.9 |
| Vegetables | 15.3 | 9.3 | 4.5 | 11.0 | 0.5 | 4.6 | 6.2 | -3.2 | 4.5 | 5.7 | 1.7 |
| Meats | 9.1 | 5.4 | 2.4 | 1.8 | 9.6 | -0.3 | 1.3 | -1.7 | 2.1 | 0.3 | -0.6 |
| Wheat (+ processed) | 8.4 | 5.0 | 3.5 | 4.6 | 3.4 | 0.6 | 10.4 | 1.3 | 0.2 | 1.8 | 0.0 |
| Oilseeds and edible oils | 6.5 | 3.9 | 3.4 | 5.2 | 0.2 | 2.6 | 4.5 | 1.0 | 1.4 | 2.7 | 3.9 |
| Fish and fish products | 6.3 | 3.8 | 2.5 | 1.6 | 3.6 | 5.0 | 0.3 | -1.7 | 2.1 | 3.3 | 2.7 |
| Milk and dairy products | 5.6 | 3.3 | 2.9 | 6.1 | 0.0 | -0.3 | 3.4 | 0.7 | 0.3 | -0.1 | 0.5 |
| Maize and other grains | 4.1 | 2.6 | -0.5 | 1.5 | -5.5 | -0.1 | 0.2 | -4.1 | 1.2 | 6.3 | 0.0 |
| Fruits | 3.9 | 2.3 | 1.1 | 0.9 | 1.4 | 1.0 | 1.0 | -1.2 | -0.5 | -0.3 | -0.6 |
| Sugar | 2.7 | 1.7 | 1.5 | 2.3 | 0.0 | 0.2 | 4.5 | -0.9 | 2.3 | 3.1 | 3.5 |

Source. Anderson, Ivanic, Martin (2014)

# Price transmission

- Dawe (2008) found that transmission rates of rice and wheat prices were generally low in Asia. In India, Philippines, and Vietnam the pass-through was just 6–11 percent, but in the remaining countries it was 41–65 percent.

- Rapsomanikis (2009) in a study of several Eastern and Southern Africa countries found that transmission of international to domestic maize prices is generally strong, but it takes several months for full transmission (4-8 in most cases).

- A variety of trade distortions aimed at insulating domestic markets from world price shocks, end up in aggregate to destabilize the world prices themselves. Anderson, Ivanic and Martin (2014) found that the aggregate effect of all countries' price-insulating behavior during 2006–08 was to raise the price in the international marketplace by 52 percent for rice, by 18 percent for both wheat and maize, and by 31 percent for edible oils.

# Impact of price instability on smallholders

- Most studies estimate large negative impacts of food commodity price increases on household welfare.

- Most empirical analyses are estimates not based on actual observed effects

- Consideration not given to coping mechanisms and consumption smoothing behavior

# Do market distortions and structural features affect market instability?

- Trade insulating policies, while decreasing domestic market instability tend to increase world instability (beggar thy neighbor) (Tyers and Anderson , 19920
- More recently Anderson and Nelgen (2010) examined market insulating behavior during the recent food crisis, and found that the average short-term price transmission elasticities for the 11 most traded agricultural commodities, was 0.5 in developing countries and 0.54 in high income countries in the period 1986-2004, hence not much different.

# Asymmetries and market instability

- Morriset (1997) showed that spreads between domestic consumer prices and respective international commodity prices, as well as spreads between domestic wholesale prices and international prices increased dramatically in the 25 year period before 1997, because of the asymmetric response of domestic consumer prices to movements in world prices.

- In all major consumer markets, decreases in world commodity prices have been systematically much less transmitted than increases to domestic consumer prices.

- This asymmetric response, which has been attributed to trade restrictions and processing costs, appears rather to be largely caused by the behavior of international trading companies.

- The impact has been great: this oligopolistic behavior may have cost commodity exporting countries over US$100 billion a year because they have limited the expansion of the final demand for these products in the major consumer markets.

- That asymmetric price transmission (APT) is a widespread phenomenon has been well documented (Meyer and von Cramon Taubadel, 2004)

- On explanations of this asymmetry, the leading view is that of market power by oligopolistic firms.

- Other explanations include asymmetric information by market actors, asymmetric adjustment costs, price support, and skewness of demand and supply shocks.

- There are not adequate theoretical models on which to base empirical estimations, and hence this topic is an area of considerable research interest and potential.

# Market instability and poverty traps

- The idea is that a short term shock may induce a household to lose a substantial amount of its productive assets, thus, in the presence of credit constraints, not allowing it to produce adequate income in subsequent periods, and hence falling in a state of chronic poverty.

- Several ways in which a household can experience a short-term real income shock. These include asset losses, through for instance, health related shocks, even deaths, that could induce loss of productive labor, or natural disaster, which could destroy assets, or current agricultural production. Market related shocks are related to adverse price developments, which could affect negatively both sales of cash crops, declines in labor opportunities or declines on wages, or increases in prices of commodity consumed.

- Increases in market prices of basic purchased commodities, such as wheat, maize, or rice, would have to be substantial to induce a large income shock.

- For instance if a household spends 30 percent of its budget on maize, or rice, then a 50 percent increase in the price of the commodity would imply a 15 percent real income shock (0.5*0.3). To accommodate this the household could employ a variety of "consumption smoothing" strategies, or reduce the amount of consumption of the staple. However, as the amount of consumption decline would have to be very large to maintain the level of real income (in this example it would take a 50 percent decrease in maize consumption to nullify the rise in price), households normally do apply a range of such methods to maintain or not reduce much their real consumption.

# Can agricultural market volatility be prevented or lessened?

- Major determinants of volatility are
- 1. Shocks to production and consumption
- 2. Passive and active border and domestic policies
- 3. Stock holding behavior
- Difficult to prevent food market volatility and food price spikes. Better to instill more confidence in markets so as to prevent hoarding behavior and overreactions by public and private agents
- To reduce global volatility need to influence national food policies and stocks
- Policy changes through WTO, OECD, UN fora
- In the absence of global coordinated efforts  countries must resort to  management of the various import risks

# Four ways to manage food import risks

- **avoiding or reducing the risk** altogether (by altering domestic production, higher degree of staple food self sufficiency)

- **change the fundamentals of supply and demand**, by manipulating directly the markets that create those risks (through for instance buffer stocks for global price stabilization)

- **transfer some of the risk to a third party for a fee**. This is the standard approach to insurance

- **do none of the above** and just cope

- Basic problem is **market unpredictability**

# Policy options for food importing developing countries to deal with external unpredictable and high food prices

- Trade policies (tariff changes, export taxes, restrictions) not very effective
- Domestic taxation policies: not very effective
- Stock policies. Not effective and expensive
- Input and other production subsidies (may work in some cases)
- Combine small scale market operations with effectively targeted safety nets
- Regional free trade may enhance regional food security
- Coordination and information between private and public sectors

# Market based approach. Hedging food import price risk with futures and options

- **Relevant questions.**
- Better to hedge with futures, options or combination?
- At what exchange to hedge?
- What is a good hedging strategy?
- What is technical capability needed?
- What are the costs of hedging?
- What are the likely benefits and costs given past price behaviour?

# Issues and risks of futures and options trading

- Futures trading involve sophisticated analysts and traders.
- A food importing country could participate basically as a hedger not as speculator
- With futures trading a fund is needed to start trading and respond to margin calls (usually a fraction of the amount traded)
- Margin calls have to be paid immediately otherwise positions are closed, hence need to have access to quick financial resources
- Purchase of call or put options entail only a one time cost (risk is of losing the amount invested in the option if option not exercised).

# What do simulation exercises show? (from Sarris, Conforti, Prakash, 2011)

- Hypothetical situation
- Agent knows that at time 1, need to import $m1$ units of the basic cereal (eg. wheat).
- The price he will pay when ordering the above amount will be denoted as $p1$.
- $f0$ is the futures price of the commodity observed at the current period (which is denoted by a subscript 0) for the futures contract expiring at the, or nearest after, the period 1, at which the actual order for imports will be placed.
- $f1$ the price of the same futures contract at time 1.
- $x$ is the amount of futures contracts purchased at the current period
- $z$ is the amount of call options contracts purchased at the current period.
- The call option contract is written on the same futures contract expiring at or soonest after period 1, and stipulates that if the futures price $f1$ at time 1 is above a strike price $s$, determined at the time of the purchase of the option, then the owner of the call option can "exercise" the option and receive the difference $f1 - s$ between the futures price at period 1 and the strike price $s$.
- The price of the option in the current period is denoted by $r0$,
- The profit from the option in period 1 is denoted by $\pi1$. This profit will be equal to $f1 - s$ if the option is exercised, and zero otherwise.

# Hedging food import price risk with futures and options.

- Foreign exchange cost to the agent can be written as follows.

$$M = p_1 m_1 - (f_1 - f_0)x - (\pi_1 - r_0)z$$

- agent wishes to minimize the conditional variance of the above

- cash price is assumed as a linear function of the near futures price.

$$p_1 = \alpha + \beta f_1 + q$$

# Hedging food import price risk with futures and options. Theory (3)

- Assume futures prices are unbiased
- Optimal solution is $x = \beta m_1$ and z=0.
- Optimal hedge ratio with call options only is also equal to $\beta$, irrespective of the strike price.

# Empirical implementation (1). Can monthly wheat imports be hedged with futures and options in the Chicago market?

- Bulk of global wheat imports is obtained from the US, Australia, and Argentina
- Consider US Gulf price as an indicative price for all wheat imports
- Gulf and near futures Chicago prices are cointegrated, and adjustment to short term shocks is quite fast
- Simulations involve buying futures or call options k months in advance of the actual order, and selling them when the actual physical transaction for wheat imports is concluded
- Assumed that agent buys futures *k* months in advance of date when need to contract the actual delivery.
- Contract date assumed to be one month before the needed monthly physical delivery of import
- For call options strike price is parameterized as *(1+α)* $p^{f}_{t,t+k}$

namely (1+alpha) times the futures price observed in month *t* for the contract expiring at or in the nearest month after the period *t+k,* when the actual transaction will be made

# Empirical implementation (2).

- objective of the hedging exercise is to reduce the conditional variance of import bills

$$M_{t+k} - E(M_{t+k,t}) = \{p_{t+k} - E(p_{t+k,t})\}m_{t+k}$$

- When the same imports are hedged with futures, the unpredictable change in the import cost is equal to

$$\{[p_{t+k} - E(p_{t+k,t})] - \beta(\pi_{t+k} - r_t - \tau_o r_t)\}m_{t+k}$$

- when the same imports are hedged only with call options, the unpredictable change in the import cost is equal to:

$$\{[p_{t+k} - E(p_{t+k,t})] - \beta(f_{t+k} - f_t - \tau_f f_t - m \arg c)\}m_{t+k}$$

**Average unanticipated prediction errors of cash and futures prices, coefficients of variation of cash and futures prices, and standard deviations of percentage prediction errors of cash and futures prices for wheat on CBOT over 1985-2008**

| | | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 |
|---|---|---|---|---|
| Average Gulf price (USD/ton) | | 143.3 | 257.6 | 157.6 |
| $(P_t - E_{t-k}(P_t))/P_t$ (percent) | k=2 | -1.1 | 1.5 | -0.7 |
| | k=4 | -1.2 | 1.6 | -0.9 |
| | k=6 | -1.0 | 4.2 | -0.3 |
| $(F_t - F_{t-k,t})/P_t$ (percent) | k=2 | -0.3 | 0.9 | -0.2 |
| | k=4 | -1.3 | 1.0 | -1.0 |
| | k=6 | -1.9 | 3.5 | -1.2 |
| CV of Gulf price (percent) | | 18.9 | 30.3 | 33.7 |
| CV of CBOT near futures price | | 17.1 | 32.2 | 31.8 |
| Stdev of $(P_t - E_{t-k}(P_t)/P_t)$ (percent) | k=2 | 8.3 | 16.1 | 9.6 |
| | k=4 | 10.9 | 22.6 | 13.0 |
| | k=6 | 13.3 | 26.0 | 15.6 |
| Stdev $[F_t - (F_{t-k,t})/P_t]$ (percent) | k=2 | 8.0 | 16.2 | 9.4 |
| | k=4 | 10.4 | 22.6 | 12.6 |
| | k=6 | 12.9 | 25.6 | 15.2 |

Source. Sarris, Conforti and Prakash, 2009

# Unanticipated normalized standard deviations of monthly wheat import bill changes with and without hedging with futures

| | Unanticipated normalized standard deviation of monthly import bill changes without hedging | | | Unanticipated normalized standard deviation of monthly import bill changes, when hedged with futures only | | | Percent difference from unhedged | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 |
| | k=2 | | | k=2 | | | k=2 | | |
| Bangladesh | 10.0 | 21.1 | 16.4 | 6.0 | 5.9 | 6.2 | -40.5 | -72.1 | -61.8 |
| China | 11.1 | 20.3 | 11.9 | 5.2 | 11.2 | 5.5 | -53.3 | -44.9 | -53.3 |
| Egypt | 9.4 | 21.5 | 15.5 | 5.3 | 6.0 | 5.8 | -43.1 | -72.0 | -62.6 |
| India | 24.3 | 27.7 | 41.3 | 14.0 | 25.7 | 35.4 | -42.3 | -7.2 | -14.4 |
| Indonesia | 10.9 | 18.7 | 17.0 | 6.8 | 6.8 | 7.1 | -37.8 | -63.8 | -58.5 |
| Mozambique | 9.4 | 15.0 | 14.9 | 6.9 | 7.9 | 8.4 | -26.1 | -47.2 | -43.4 |
| Nicaragua | 13.8 | 23.6 | 18.8 | 7.0 | 8.1 | 7.7 | -49.2 | -65.6 | -58.9 |
| Pakistan | 14.9 | 48.2 | 30.6 | 5.9 | 4.8 | 5.8 | -60.1 | -90.0 | -81.2 |
| Philippines | 10.0 | 18.4 | 14.7 | 6.1 | 6.6 | 6.6 | -39.2 | -64.0 | -55.1 |
| Sudan | 10.3 | 19.1 | 16.0 | 6.8 | 6.7 | 7.2 | -34.5 | -64.8 | -54.9 |
| Tanzania | 11.8 | 26.8 | 33.8 | 9.4 | 6.9 | 10.3 | -19.9 | -74.3 | -69.6 |
| | k=4 | | | k=4 | | | k=4 | | |
| Bangladesh | 14.4 | 30.3 | 23.5 | 5.9 | 5.9 | 6.2 | -58.7 | -80.6 | -73.4 |
| China | 16.0 | 27.0 | 17.1 | 5.2 | 11.2 | 5.5 | -67.5 | -58.5 | -67.5 |
| Egypt | 12.3 | 23.1 | 17.8 | 5.3 | 6.0 | 5.8 | -56.6 | -73.9 | -67.4 |
| India | 30.8 | 25.1 | 40.4 | 14.0 | 25.7 | 35.4 | -54.4 | 2.4 | -12.3 |
| Indonesia | 14.1 | 21.9 | 20.7 | 6.0 | 6.8 | 7.1 | -57.3 | -69.0 | -65.9 |
| Mozambique | 12.6 | 22.2 | 21.5 | 6.9 | 7.9 | 8.4 | -44.9 | -64.3 | -60.7 |
| Nicaragua | 21.5 | 32.8 | 27.4 | 7.0 | 8.1 | 7.7 | -67.3 | -75.3 | -71.8 |
| Pakistan | 20.9 | 52.7 | 35.0 | 5.9 | 4.8 | 5.8 | -71.7 | -90.9 | -83.6 |
| Philippines | 12.8 | 23.6 | 19.0 | 6.1 | 6.6 | 6.6 | -52.6 | -71.9 | -65.2 |
| Sudan | 12.8 | 18.8 | 17.4 | 6.8 | 6.7 | 7.2 | -46.9 | -64.2 | -58.5 |
| Tanzania | 14.3 | 24.8 | 31.8 | 9.4 | 6.9 | 10.3 | -34.0 | -72.3 | -67.6 |

# Unanticipated normalized standard deviations of monthly wheat import bill changes with at the money options hedging only

| | Unanticipated normalized standard deviation of monthly import bill changes without hedging | | | Unanticipated normalized standard deviation of monthly import bill changes, when hedged with at the money options only | | | Percent difference from unhedged | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2008-12 |
| | k=2 | | | k=2 | | | k=2 | | |
| Bangladesh | 10.0 | 21.1 | 16.4 | 7.6 | 12.7 | 10.7 | -24.5 | -40.0 | -34.5 |
| China | 11.1 | 20.3 | 11.9 | 6.9 | 13.5 | 7.4 | -37.9 | -33.5 | -37.9 |
| Egypt | 9.4 | 21.5 | 15.5 | 6.4 | 13.1 | 10.0 | -31.6 | -39.3 | -35.9 |
| India | 24.3 | 27.7 | 41.3 | 20.7 | 25.5 | 37.4 | -14.9 | -7.8 | -9.3 |
| Indonesia | 10.9 | 18.7 | 17.0 | 7.7 | 11.6 | 11.2 | -29.3 | -37.9 | -34.5 |
| Mozambique | 9.4 | 15.0 | 14.9 | 8.1 | 8.1 | 10.5 | -13.3 | -45.9 | -29.6 |
| Nicaragua | 13.8 | 23.6 | 18.8 | 9.5 | 9.1 | 9.8 | -31.6 | -61.3 | -47.8 |
| Pakistan | 14.9 | 48.2 | 30.6 | 9.0 | 29.9 | 19.4 | -39.6 | -38.0 | -36.6 |
| Philippines | 10.0 | 18.4 | 14.7 | 7.6 | 11.6 | 10.1 | -23.2 | -36.8 | -31.3 |
| Sudan | 10.3 | 19.1 | 16.0 | 8.1 | 12.1 | 11.0 | -21.6 | -36.9 | -31.4 |
| Tanzania | 11.8 | 26.8 | 33.8 | 11.6 | 17.0 | 22.7 | -2.1 | -36.7 | -32.9 |
| | k=4 | | | k=4 | | | k=4 | | |
| Bangladesh | 14.4 | 30.3 | 23.5 | 10.3 | 15.1 | 13.4 | -28.1 | -50.1 | -43.1 |
| China | 16.0 | 27.0 | 17.1 | 9.1 | 16.1 | 9.7 | -43.3 | -40.2 | -43.2 |
| Egypt | 12.3 | 23.1 | 17.8 | 8.3 | 10.9 | 9.8 | -32.2 | -52.7 | -45.0 |
| India | 30.8 | 25.1 | 40.4 | 29.2 | 26.1 | 39.6 | -5.1 | 3.9 | -2.0 |
| Indonesia | 14.1 | 21.9 | 20.7 | 9.7 | 10.7 | 11.4 | -30.8 | -51.3 | -45.1 |
| Mozambique | 12.6 | 22.2 | 21.5 | 10.4 | 11.2 | 12.3 | -17.5 | -49.4 | -42.6 |
| Nicaragua | 21.5 | 32.8 | 27.4 | 15.4 | 10.8 | 14.5 | -28.7 | -67.0 | -47.3 |
| Pakistan | 20.9 | 52.7 | 35.0 | 14.5 | 30.2 | 21.7 | -30.6 | -42.7 | -38.1 |
| Philippines | 12.8 | 23.6 | 19.0 | 9.1 | 11.7 | 10.9 | -28.7 | -50.4 | -42.8 |
| Sudan | 12.8 | 18.8 | 17.4 | 9.7 | 9.1 | 10.2 | -23.6 | -51.7 | -41.4 |
| Tanzania | 14.3 | 24.8 | 31.8 | 12.8 | 14.8 | 20.3 | -10.4 | -40.6 | -36.3 |

# Hedging in organized exchanges. Differences between unhedged and hedged wheat import bills (Sarris, Conforti, Prakash, 2011)

|  | Average monthly import bills without hedging ('000 USD) | | Average monthly import bills with futures hedging (percent difference from average unhedged import bills) | | Average monthly import bills with at the money options hedging (percent difference from average unhedged import bills) | |
|---|---|---|---|---|---|---|
|  | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2005-12 | 2006-1 to 2008-12 | 1985-7 to 2005-12 | 2006-1 to 2008 12 |
|  | k=2 | | | | | |
| Bangladesh | 19001 | 41690 | -0.3 | -0.6 | -1.4 | -1.6 |
| China | 80701 | 3497 | -0.7 | -0.8 | -2.3 | -1.3 |
| Egypt | 80816 | 161110 | 0.0 | -0.3 | -1.2 | -1.9 |
| India | 8696 | 54177 | 2.7 | -5.3 | 4.5 | -5.4 |
| Indonesia | 39354 | 107564 | 0.3 | -1.4 | 2.1 | -2.4 |
| Mozambique | 2406 | 7051 | 0.5 | -3.9 | 1.5 | -3.9 |
| Nicaragua | 1254 | 2512 | 0.0 | -3.2 | 1.4 | -3.5 |
| Pakistan | 19523 | 34622 | -1.0 | 7.6 | 1.7 | 1.8 |
| Philippines | 25505 | 54984 | 0.3 | -1.4 | 2.5 | -2.4 |
| Sudan | 9230 | 22000 | 0.5 | -1.1 | -0.1 | -2.4 |
| Tanzania | 1852 | 10168 | 1.3 | 2.4 | 3.2 | -0.1 |
|  | k=4 | | | | | |
| Bangladesh | 19001 | 41690 | 0.7 | -1.2 | -1.9 | -4.9 |
| China | 80701 | 3497 | -1.0 | 0.9 | -3.2 | -4.9 |
| Egypt | 80816 | 161110 | 0.8 | -3.5 | -1.6 | -7.1 |
| India | 8696 | 54177 | 3.7 | -6.4 | 5.6 | -9.5 |
| Indonesia | 39354 | 107564 | 1.2 | -4.0 | 2.0 | -7.5 |
| Mozambique | 2406 | 7051 | 1.7 | -5.3 | 1.2 | -11.2 |
| Nicaragua | 1254 | 2512 | 1.6 | -4.6 | 1.9 | -7.0 |
| Pakistan | 19523 | 34622 | 0.5 | 5.8 | 2.2 | -0.8 |
| Philippines | 25505 | 54984 | 1.1 | -3.3 | 2.4 | -7.8 |
| Sudan | 9230 | 22000 | 1.6 | -5.3 | -0.8 | -8.9 |
| Tanzania | 1852 | 10168 | 3.2 | 0.5 | 3.2 | -4.9 |

# External insurance systems available in developed countries but not in DCs

- Government subsidized insurance
- Futures and options markets
- OTC risk management products
- International compensatory finance mechanisms (e.g IMF food facility) ex-post and do not deal with immediate problem
- In developed countries much more predictability of agricultural prices because of policies (e.g minimum prices)

# Some major questions relevant to agricultural price risk in Africa

- Is agricultural price risk a factor in growth and poverty reduction in Africa?
- What are the factors affecting agricultural price risk?
- How do farmers manage price risks? Are there inefficiencies in factor use and production due to price risk factors? If yes in which markets? Why?
- Liquidity constraints, access to seasonal credit and implications for risk
- What are the impacts or risk at various segments of the value chain?

# Rural households in developing countries face multiple risks

- Weather: drought, hurricanes, floods, fire
- Pests and diseases, animal diseases
- Prices (e.g. the latest food crisis, or price collapses)
- Accidents and Illnesses
- Death
- Economic crises

- Crime and war

- Individual risk management and risk coping strategies maybe detrimental to income growth
- Considerable residual income risk and vulnerability

# Farmer exposure to price risk in Africa

- exposure to price risks is likely to affect only a small portion of total household income.

- of the total farm population only a small share is likely to be engaged in market operations of the major crops in any major way, and hence be exposed to market price risks.

- Is low price risk exposure the result of farmer reaction to high price risks in reaction to the absence of risk management options and tools?

- In the presence of price risk management farm production structure may become more specialized

# Tanzania: Agricultural household vulnerability to price and weather shocks is high but portion due to covariate shocks varies by region

| | Number of hhs | Mean vulnerability | Proportion of consumption variance due to covariate factors | Pc expenditures |
|---|---|---|---|---|
| **Kilimanjaro** | | | | |
| ALL | 191,585 | 0.23 | 0.15 | 200.59 |
| Non Poor | 128,414 | 0.15 | 0.14 | 251.98 |
| Poor | 63,171 | 0.40 | 0.15 | 97.75 |
| **Ruvuma** | | | | |
| ALL | 173,932 | 0.54 | 0.71 | 152.24 |
| Non Poor | 77,021 | 0.40 | 0.67 | 232.05 |
| Poor | 96,911 | 0.66 | 0.73 | 89.04 |

Source: Sarris and Karfakis (2006)

**Table 5. Distribution of small-scale farm population according to their position in the staple grain market, selected countries.**

| Household category with respect to main staple grain: | Zambia (maize) | Mozambique (maize) | Kenya (maize) | Malawi (maize) | Ethiopia (maize and teff) |
|---|---|---|---|---|---|
| | ----- % of rural farm population ----- | | | | |
| Sellers only: | 19 | 13 | 18 | 5 | 13 |
|   top 50% of total sales[*] | 2 | 2 | 2 | 1 | 2 |
|   bottom 50% of total sales[**] | 21 | 10 | 16 | 4 | 11 |
| Buyers only | 33 | 51 | 55 | na | 60 |
| Buy and sell (net buyers) | 3 | 12[***] | 7 | na | 13 |
| Buy and sell (net sellers) | 5 | | 12 | na | 12 |
| Neither buy nor sell | 39 | 24 | 8 | na | 2 |
| | | | | | |
| | 100% | 100% | 100% | 100% | 100% |

Source. Jayne, Chapoto and Govereh, 2010

# Tanzania: Percentage of households affected by various shocks between 1999 and 2003, by region and status as cash crop grower or not

|  | Kilimanjaro | | Ruvuma | | Total |
|---|---|---|---|---|---|
|  | Cash crop | no cash crop | cash crop | no cash crop |  |
| **Health** | | | | | |
| Death | 23.1 | 29.9 | 16.3 | 19 | 21.8 |
| Illness | 23.3 | 22.8 | 18.5 | 19.1 | 21 |
| **Climatic** | | | | | |
| Drought | 27.8 | 39.9 | 2.8 | 7.1 | 19.2 |
| Excessive rains | 4.3 | 11.5 | 4.2 | 2.2 | 5.4 |
| **Agricultural production** | | | | | |
| Harvest loss | 5.2 | 8.6 | 6.1 | 4.4 | 6 |
| Livestock loss | 5.1 | 8.5 | 3.1 | 5.4 | 5.3 |
| Post harvest cereal loss | - | - | 0.9 | 2.9 | 1.7 |
| **Economic** | | | | | |
| Cash crop price shock | - | - | 5.8 | 2.7 | 4.6 |
| Cereal price shock | - | - | 0.8 | 5.1 | 2.5 |
| Unemployment | 0.3 | 1.7 | 0.2 | 0 | 0.5 |
| **Property** | | | | | |
| Theft | 4.4 | 6.9 | 3.7 | 6.9 | 5.2 |
| Fire/house destroyed | 0.2 | 1.4 | 3 | 3.7 | 1.9 |
| Land loss | 0.2 | 0.9 | 0.2 | 0 | 0.3 |

# Ethiopia: The incidence of serious shocks 1999-2004

| Type of shocks reported | % |
|---|---|
| Drought | 47 |
| Death of head, spouse or another person | 43 |
| Illness of head, spouse or another person | 28 |
| Inability to sell outputs or decreases in output prices | 15 |
| Pests or diseases that affected crops | 14 |
| Crime | 13 |
| Policy/political shocks (land redistribution, resettlement, arbitrary taxation) | 7 |

Source: Dercon. Data from Ethiopia Rural Household Survey

# What are the problems?

- Household risk in agriculture can be very large (CVs of income larger than 50%)
- Impact of shocks on
  - Consumption, and especially food consumption, nutrition
  - Drawing down of productive assets, such as animals, land, natural resources
  - Becoming destitute and being stuck in a poverty trap
  - Famines
- Underinvestment in agricultural inputs, technology, sustainability, education
- Misallocation of investment into lower paying, but risk-reducing investments. Low degree of specialization

# What are we worried about

- Impact of shocks on
  - Consumption, and especially food consumption, nutrition
  - Drawing down of productive assets, such as animals, land, natural resources
  - Becoming destitute and being stuck in a risk induced poverty trap
  - Famines

- Because of need to keep liquid reserves, underinvestment in agricultural inputs, technology, education

- Misallocation of investment into lower paying, but risk-reducing investments

# But there are also macro consequences

- Weather, pests, diseases, prices, economic crises, war
- Examples
  - Droughts lead to unpredicted higher import bills
  - The fertilizer price buildup  may make subsidies unsustainable
  - Hurricanes and floods strain the national budgets
  - Economic crises reduce national agricultural incomes and employment
- Some of these can be mitigated via forward markets and national or international insurance, but that is rarely done
- A fertile ground for further action?

# Determinants of farmer behavior

- Small farmers are not excessively risk averse
  - Absolute or relative risk aversion are around one or less
  - They are only slightly higher for the poor than for the "rich"
- But internal discount rates are often enormous, especially for the poor

*Liquidity and credit constraints may be more important determinants of behavior than risk aversion*

# Why the credit constraints?

- The poor typically can only borrow small amounts for short periods, (or in linked transactions)
  - They may be too poor to be reliable borrowers
  - They have no credible collateral
- Formal credit in rural areas is much more constrained than in urban areas
  - Because of heterogeneity of areas, plots of land, and the seasons
  - Because of the moral hazard
  - Because of seasonality
  - Because of covariance of risk
- Rural banking requires very high reserve ratios, or has to be done by banks with urban business
  - Microfinance has not overcome these problems

# Risk and rural financial markets

**Stylized features of low income, smallholder agriculture:**

- Costs of acquiring & transmitting information high
- Strong informational asymmetries
- Multiple sources of risk, much of which is correlated across individuals
- These features result in endogenous market failures that militate against smallholders:
- Absence of conventional insurance contracts
- Supply Side Portfolio restrictions for ag loans
- Contractual restrictions (relatively high collateral requirements) imply quantity rationing
- Also demand side restrictions (risk rationing)

# Why is it so hard for smallholders to insure their crops?

- Because of heterogeneity of areas, plots of land, and the seasons

- Because of moral hazard

- Because of covariance of risk

- Because of low correlation between weather and income

- Internal discount rates very high

# How do households adjust ex-post to shocks?

1. Draw down stocks and savings

2. Increase labor supply

3. Borrowing

4. Gifts and interest free loans

5. Selling of livestock

6. Selling of land: not a major factor in Africa more in Asia

7. Temporary migration

# Ex-ante adjustments to reduce risks

**CROP AND ENTERPRISE DIVERSIFICATION**

**BUILDUP OF STOCKS, SAVINGS AND ASSETS**

**COMPOSITION OF ASSETS**

**USE LESS INPUTS**

**SOCIAL SHARING ARRANGEMENTS**

# Results of research

- Individual consumption is fairly well insured (consumption smoothing) , but only partially so, and better for the "rich" than for the poor
- Food consumption may be even better insured
  - But not against systemic shocks
  - Or when social networks break down
- Insurance varies a lot by wealth
  - The poor are poorly insured
  - While the "rich" may be fully insured against individual and systemic shocks
- In high risk environments, the profit loss from adjustment to risks by the poor is likely to be high
- Covariate risks are much more difficult to insure

# Implications

- Focus on systemic risks, such as weather, prices
- Understand the relative importance of different risks for farmers' income and welfare
- Worry more about impact of risk on agricultural supply of the small holders and poor as those who supply the most are better insured via existing market based risk management institutions
- Focus on macro-economic risk reduction
- Within systemic risks focus on market failure risk layer

# Technological and institutional innovations to reduce exposure to uninsured weather risks

**Three strategies**

**1. Reduce exposure to covariate risks**

Resilient farming systems. E.g., flood and drought tolerant new cereal varieties (CGIAR)

**2. Reduce cost of risk management strategies**

Weather index or price insurance

**3. Provide access to more effective risk-coping opportunities**

Guaranteed employment, productive safety nets

# Despite small exposure to price risks, interest in price insurance is high.
# Tanzania 2003: Interest in minimum price coffee insurance among coffee producing househjolds

**4a. Kilimanjaro**

|  |  | Round 2 | | |
|---|---|---|---|---|
|  |  | No | Yes | Total |
|  | No | 22,454 | 22,772 | 45,226 |
| **Round 1** | Yes | 19,976 | 38,843 | 58,819 |
|  | Total | 42,430 | 61,615 | 104,045 |

**4b. Ruvuma**

|  |  | Round 2 | | |
|---|---|---|---|---|
|  |  | No | Yes | Total |
|  | No | 3,959 | 3,198 | 7,157 |
| **Round 1** | Yes | 12,962 | 31,183 | 44,145 |
|  | Total | 16,921 | 34,381 | 51,302 |

# Tanzania 2004. Interest in minimum price cashew nut insurance among cashew nut producing households in Ruvuma. (Number of households)

|  |  | Round 2 | | |
|---|---|---|---|---|
|  |  | No | Yes | Total |
|  | No | 2,779 | 5,530 | 8,309 |
| **Round 1** | Yes | 8,916 | 19,470 | 28,386 |
|  | Total | 11,695 | 25,000 | 36,694 |

# What affects the desirability for minimum price insurance?

- Income instability variables
- Household coping mechanisms

## Tanzania 2003: Summary statistics of the predicted value of WTP for coffee minimum price insurance in Kilimanjaro.

| | No of hh's | Average WTP | St. Dev. |
|---|---|---|---|
| **400 Tsh minimum price contract** | | | |
| WTP (Tsh) | 63,803 | 67.93 | 26.98 |
| WTP (Share of 400Tsh min. price) | 63,803 | 16.98 | 6.75 |
| **600 Tsh minimum price contract** | | | |
| WTP (Tsh) | 58,619 | 74.32 | 28.29 |
| WTP (Share of 600Tsh min. price) | 58,619 | 12.39 | 4.71 |
| **800 Tsh minimum price contract** | | | |
| WTP (Tsh) | 60,116 | 113.85 | 40.62 |
| WTP (Share of 800Tsh min. price) | 60,116 | 14.23 | 5.08 |

## Tanzania 2003. Summary statistics of the predicted value of WTP for coffee minimum price insurance in Ruvuma.

| | No of hh's | Average WTP | St. Dev. |
|---|---|---|---|
| **400 Tsh minimum price contract** | | | |
| WTP (Tsh) | 46,002 | 23.01 | 11.61 |
| WTP (Share of 400Tsh min. price) | 46,002 | 5.75 | 2.90 |
| **600 Tsh minimum price contract** | | | |
| | No of hh's | Average WTP | |
| WTP (Tsh) | 45,759 | 44.70 | 16.19 |
| WTP (Share of 600Tsh min. price) | 45,759 | 7.45 | 2.69 |
| **800 Tsh minimum price contract** | | | |
| | No of hh's | Average WTP | St. Dev. |
| WTP (Tsh) | 45,563 | 74.05 | 21.53 |
| WTP (Share of 800Tsh min. price) | 45,563 | 9.25 | 2.69 |

# Tanzania 2003. Summary statistics of the predicted value of WTP for cashew nut minimum price insurance in Ruvuma.

| | No of hh's | Average WTP | St. Dev. |
|---|---|---|---|
| **300 Tsh minimum price contract** | | | |
| WTP (Tsh) | 30,348 | 24.08 | 12.17 |
| WTP (Share of 300Tsh min. price) | 30,348 | 8.02 | 4.05 |
| **450 Tsh minimum price contract** | | | |
| WTP (Tsh) | 30,348 | 29.71 | 12.79 |
| WTP (Share of 450Tsh min. price) | 30,348 | 6.60 | 2.84 |
| **600 Tsh minimum price contract** | | | |
| WTP (Tsh) | 26,794 | 26.47 | 8.03 |
| WTP (Share of 600Tsh min. price) | 26,794 | 4.41 | 1.33 |

# Kilimanjaro coffee: Welfare benefit and cost for minimum price insurance.

| Premium rule | Premium value (Tsh/kg) | Quantity insured (tons) | Number of households | Total premium (million Tsh) | Premium as share of coffee sales (percent) | Consumer surplus (million Tsh) | Consumer surplus as share of coffee sales (percent) |
|---|---|---|---|---|---|---|---|
| **400 Tsh minimum price** | | | | | | | |
| Mean WTP | 67.9 | 3367 | 34,362 | 228.7 | 15.5 | 29.5 | 2.0 |
| Mean WTP + 1 SD | 84.9 | 2247 | 12,104 | 190.8 | 19.5 | 2.7 | 0.3 |
| Mean WTP - 1 SD | 51.0 | 4414 | 51,878 | 224.9 | 11.3 | 85.4 | 4.3 |
| Mean WTP - 2 SD | 34.0 | 5352 | 62,394 | 181.8 | 7.5 | 168.6 | 7.0 |
| **600 Tsh minimum price** | | | | | | | |
| Mean WTP | 74.3 | 2787 | 59,963 | 207.1 | 17.6 | 52.0 | 4.4 |
| Mean WTP + 1 SD | 86.7 | 1375 | 23,986 | 119.2 | 20.1 | 4.5 | 0.8 |
| Mean WTP - 1 SD | 61.9 | 4328 | 85,033 | 268.1 | 13.7 | 147.4 | 7.5 |
| Mean WTP - 2 SD | 49.5 | 5203 | 99,566 | 257.7 | 11.0 | 261.6 | 11.1 |
| **800 Tsh minimum price** | | | | | | | |
| Mean WTP | 113.9 | 4080 | 64,138 | 464.6 | 25.5 | 68.7 | 3.8 |
| Mean WTP + 1 SD | 128.1 | 3042 | 17,903 | 389.6 | 29.2 | 1.2 | 0.1 |
| Mean WTP - 1 SD | 99.6 | 4830 | 85,043 | 481.1 | 22.1 | 188.6 | 8.7 |
| Mean WTP - 2 SD | 85.4 | 5099 | 98,058 | 435.4 | 18.9 | 352.1 | 15.3 |

# Ruvuma coffee: Welfare benefit and cost for minimum price insurance.

| Premium rule | Premium value (Tsh/kg) | Quantity insured (tons) | Number of households | Total premium (million Tsh) | Premium as share of coffee sales (percent) | Consumer surplus (million Tsh) | Consumer surplus as share of coffee sales (percent) |
|---|---|---|---|---|---|---|---|
| **400 Tsh minimum price** | | | | | | | |
| Mean WTP | 23.0 | 8118 | 26,579 | 186.8 | 6.2 | 75.3 | 2.5 |
| Mean WTP + 1 SD | 28.8 | 3625 | 11,535 | 104.3 | 8.5 | 5.0 | 0.4 |
| Mean WTP - 1 SD | 17.3 | 10400 | 35,455 | 179.5 | 4.5 | 180.0 | 4.5 |
| Mean WTP - 2 SD | 11.5 | 12900 | 43,014 | 148.5 | 3.0 | 298.3 | 6.0 |
| **600 Tsh minimum price** | | | | | | | |
| Mean WTP | 44.7 | 8866 | 28,272 | 396.3 | 12.0 | 109.9 | 3.3 |
| Mean WTP + 1 SD | 52.2 | 2670 | 6,381 | 139.2 | 15.6 | 0.9 | 0.1 |
| Mean WTP - 1 SD | 37.3 | 11600 | 38,539 | 432.1 | 9.9 | 273.4 | 6.3 |
| Mean WTP - 2 SD | 29.8 | 11800 | 39,994 | 351.6 | 8.0 | 345.2 | 7.8 |
| **800 Tsh minimum price** | | | | | | | |
| Mean WTP | 74.1 | 9352 | 33,044 | 692.5 | 19.3 | 113.6 | 3.2 |
| Mean WTP + 1 SD | 83.3 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| Mean WTP - 1 SD | 64.8 | 11200 | 38,808 | 725.8 | 17.0 | 317.2 | 7.4 |
| Mean WTP - 2 SD | 55.6 | 12400 | 42,534 | 688.8 | 14.6 | 549.6 | 11.7 |

# Ruvuma cashew nuts: Welfare benefit and cost for minimum price insurance.

| Premium rule | Premium value (Tsh/kg) | Quantity insured (tons) | Number of households | Total premium (million Tsh) | Premium as share of coffee sales (percent) | Consumer surplus (million Tsh) | Consumer surplus as share of coffee sales (percent) |
|---|---|---|---|---|---|---|---|
| **300 Tsh minimum price** | | | | | | | |
| Mean WTP | 24.1 | 4730 | 16,455 | 113.9 | 5.8 | 44.6 | 2.3 |
| Mean WTP + 1 SD | 32.1 | 1451 | 6,094 | 46.6 | 7.5 | 5.2 | 0.8 |
| Mean WTP - 1 SD | 16.1 | 6209 | 24,162 | 99.7 | 3.9 | 110.7 | 4.3 |
| Mean WTP - 2 SD | 8.0 | 7765 | 29,836 | 62.4 | 1.9 | 193.0 | 5.9 |
| **450 Tsh minimum price** | | | | | | | |
| Mean WTP | 29.7 | 4843 | 17,203 | 143.9 | 7.0 | 49.4 | 2.4 |
| Mean WTP + 1 SD | 36.3 | 1920 | 7,883 | 69.7 | 8.4 | 6.6 | 0.8 |
| Mean WTP - 1 SD | 23.1 | 6544 | 24,765 | 151.2 | 5.5 | 118.6 | 4.3 |
| Mean WTP - 2 SD | 16.5 | 7683 | 29,262 | 126.8 | 3.9 | 206.8 | 6.4 |
| **600 Tsh minimum price** | | | | | | | |
| Mean WTP | 26.5 | 4789 | 18,997 | 126.8 | 6.2 | 23.5 | 1.2 |
| Mean WTP + 1 SD | 30.9 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| Mean WTP - 1 SD | 22.1 | 6159 | 22,298 | 135.9 | 5.2 | 70.5 | 2.7 |
| Mean WTP - 2 SD | 17.7 | 6391 | 23,965 | 112.8 | 4.1 | 110.8 | 4.0 |

## Policy implications. Demand for price insurance

- There seems to be considerable variability in prices received for the main cash crops and incomes.
- This induces considerable interest in minimum price insurance.
- Instability variables contribute positively to the demand for price insurance, while the existence of coping mechanisms contributes negatively, as expected.
- Considerable welfare benefits (net of costs) of minimum price insurance.
- Market based price insurance viable (premiums comparable to option prices in organized exchanges)

# Policies to lower the probability of excessive market volatility and price spikes

- ## A. Better information (on stocks, policies, other fundamentals)
  - Effective at preventing or lessening irrational and destabilizing short term behavior

- ## B. Global early warning system of crises
  - Could be useful at triggering safety net and compensatory actions for developing countries

- ## C. Prevent export bans through WTO
  - Effective at instilling confidence in markets about smooth flow of supplies

# D. Physical stock policies, national or international

- **Should physical, public, globally managed or decentralized grain reserves to prevent spikes be instituted?**
- **Answer: Most likely no. Why:**
- Needs agreement on allocation of stocks, rules for release, financing of costs. All these technically and politically difficult
- Reserves are dependent on transparent and accountable governance
- Reserves cost money and stocks must be rotated regularly
- The countries that most need reserves are generally those least able to afford the costs and oversight necessary for maintaining them
- The private sector is better financed, better informed, and politically powerful, and counteract whatever actions a public stock can take.
- Public reserves can bring uncertainties in market, due to uncertainty about stock management policies.
- Reserves distort markets and mismanagement and corruption can exacerbate hunger rather than alleviate it
- **National stock policies if accompanied by appropriate rules of operation and management can maintain stability in domestic markets**
- Need effective control of domestic market
- Transparency and good management essential

# Other stock related policies

- **Virtual reserves to influence irrational market expectations in times of price spikes**
- Valid idea, but difficult to apply and maybe unnecessary
- Difficult to control irrational exuberance and expectations
- Applicable only in organized commodity markets with futures trading
- Can be very costly and may not be effective at preventing spikes
- **Emergency physical reserves to keep food aid flowing**
- Reasonable idea and cost effective

## E. Should commodity exchanges be reformed by:

- limiting the volume of speculation relative to hedging through regulation;

- making delivery on contracts or portions of contracts compulsory;

- imposing additional capital deposit requirements on futures transactions.

- Answer: probably YES but needs further study

- Speculation is a symptom not a cause of spikes, and has not altered market fundamentals albeit has enhanced spikes. Price spikes occur irrespective of existence of organized exchanges

# Policies to assist developing food importing countries to manage food market volatility and price spikes

- Hedge food import risks with futures and options

- Assure import financing

- Global safety nets

# A system to ensure food imports in low income countries net grain importing countries through a dedicated Food Import Financing Facility

- The major problem faced by LDCs and NFIDCs during periods of food import needs in excess of normal commercial imports, is import financing for both private as well as parastatal entities
- Major reason for this is exposure limits of exporting country private trade financing banks to various developing countries
- Need system that can provide guarantees to trade financing banks to increase temporarily their exposure limits to grain importing countries

# Basic rationale and concept of a FIFF

- **Purpose**: To allow LDCs and NFIDCs to finance commercial food imports in periods of excess import bills

- **Problem to be dealt with**: Credit and financing exposure ceilings from developed country financing institutions to LDCs and NFIDCs

- **Concept**: Provide additional finance for commercial food imports in excess of normal commercial food imports. In other words increase risk bearing capacity of financial institutions financing food imports

- **How**: By inducing increases in credit ceilings and country exposures under specific conditions, via a credible mechanism of intermediation. This can be effected by sovereign loan guarantees for the additional financing (only) by developed countries. Amounts of guarantees would not surpass 10-15 percent of food import bills of LIFDCs and would constitute a very small fraction of total debt levels of major donors (less than 0.05 percent)

# Global safety net. Proposal for a Global Financial Food Reserve (GFFR)

- Aim not to prevent spikes but to have some resources to assist quickly countries most affected by price spike

- Idea to establish a fund that would maintain a long position in basic commodities in organized exchanges (much like existing financial commodity funds). This would constitute a "virtual commodity reserve" to act as a dormant physical commodity reserve.

- When markets would go into a spike, as signaled by high probabilities of crossing appropriate price bands, the GFFR could either take delivery or take monetary profits. Such physical or financial resources could be utilized to assist, according to pre-specified rules, highly affected countries to lessen the extra cost of food commodity imports

- Would act as part of a global safety net for low income net food importing countries

- Cost modest. Between 2006 and 2008 the total cereal import bill of LDCs increased by roughly 20 percent or about 4 billion US$. If 10 percent of that could have been considered as extraordinary cost of vulnerable poor countries that would be compensated by developed countries as extraordinary aid under some global safety net, then this would amount to 400 million US$.

- If the fund before the crisis was of a size of 100 million US$, and it was all invested in cereal stocks via long future positions, then at 5 percent margin it would have commanded physical amounts, worth about 2 billion US$. The profits from a 20 percent increase in prices during the spike (and the actual increase during a spike would have been much larger than this) would then have been around 400 million US$

# What can the international community do to help developing countries deal with food market volatility
## A. Measures to lower the probability of food market upheavals

- **Support the establishment or enhancement of existing systems for the availability of national and global market information and monitoring.**

- **Establish a global early warning system of impending food price spikes.**

- **Revise the WTO rules to prevent export bans of basic food commodity products.**

- **Revise the rules of existing organized commodity exchanges in developed countries to prevent excessive speculation**

# B. Measures to help needy food importing countries to manage adverse impacts of price spikes

- Provide technical assistance to vulnerable food dependent developing countries to analyze the food risks they face in the global food market system, and assess country specific options to deal with them.
- Create a fund for the establishment of an internationally coordinated "Global Financial Food Reserve" (or GFFR) of basic food commodities
- Create a dedicated Food Import Financing Facility (FIFF) to increase trade finance for low income countries in times of food price spikes
- Support the establishment of a physical emergency reserve of about 300,000 to 500,000 tons of basic grains
- Assist food importing developing countries to develop market based strategies to manage the risks of their food imports.
- Promote the organization of appropriate commodity exchanges in both developed and developing countries
- Promote the establishment of international standardized commodity contracts in basic food commodities
- Promote the creation of permanent global safety nets relating to food price spikes

Very few of the above have been considered in the post 2008 period. But action should be now not when a price spike occurs.

# THANK YOU