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Protein Price Change in Bad Event and A Hedge Against Loss in Agribusiness

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Abstract

Uncertainties unleashed by COVID-19 affected people in agribusiness. Consumers also suffer in such a disaster. This article first tries to probe changes in protein consumption and change in prices of protein during disaster years. Then it tries to show how to protect poultry farmers in times of uncertainty using game theory.

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1. Introduction

Though agriculture is a vital sector and has garnered lots of attention and money from the government, people engaged in agriculture sustain losses in any bad event. We have often seen news items like farmers dumping tomatoes on the street or milkmen washing the streets with milk after failing to secure prices for their products. The bad spell also touches the consumers. During a bad event, when pockets get squeezed, consumers cut their consumption or switch to products they consume less during normal times. So agriculture is shaping the lives of producers and consumers alike.

Agriculture has strategic importance in ensuring food demand, job creation, value addition and saving hard-earned currency in a turbulent time. The unfolding global crisis reminds us again about the crucial role of agriculture. I would like to see how a bad spell influences the protein consumption of consumers, and I would also try to devise a means to secure the producer's interest, in this case, the poultry farmer.

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2. Analysis and policy implications

Coronavirus stretched its shadow over poultry farming, dairy farming and other agribusinesses. News reports say gloomy dairy farmers sold milk much below the market price. Mobile egg sellers sold eggs at Tk 75/dozen. In normal times, a dozen would cost Tk 120 (Market prices prevailed before April 2020). Evidently, poultry and dairy farmers bore the full brunt of the falling demand, compounded by the indefinite lockdown.

Poultry and dairy farming are 100% value-adding economic activities. Money was often drawn from local cooperatives, relatives, microfinance institutions, and public banks. Any bad spell on farming activities will make informal and institutional investors ill. So in a broader sense, many investors' money may be lost if poultry and dairy projects fail because of Coronavirus. If poultry and dairy farmers are not duly compensated for the loss, we may see a production slump in the subsequent years, adding further woes to the consumers by raising the prices of eggs and milk. The egg is the cheapest source of protein. Any supply shock or price hike in fish or meat leads to consuming more eggs. As it appears, this Coronavirus may also make a dent in our protein consumption.

I did a little analysis of the impact of disaster years on egg prices for 2012-2018. I gathered data for fish (Rui) and egg prices for the given period. Data gleaned from BBS Statistical Pocket Book 2016 and 2018 (Bangladesh Bureau of Statistics, 2016,2018).

It was assumed that fish and egg secured the bottom places in the protein ladder in terms of price for ordinary citizens. So, apart from supply and demand-side factors, egg price depends on fish price to some extent. It was also assumed that eggs were sold at Tk 95 per dozen in 2017 as the year's data was unavailable.

A semi-logarithmic regression with a dummy variable was chosen to observe the change in egg price compared to fish price. The dummy variable captured the effect of the disaster year on price change. D is 0 for calm years and 1 for disaster years.

The following regression function was constructed:

$\ln Egg_t = a + b\ Fish_t + c\ D_t$

where $\ln Egg_t$ = log natural of Egg price at t,

$Fish_t$ = Fish price at t,

D = 1 for disaster years (any kind),

= 0 for calm/ normal years.

Due to the data's time-series nature, the Durbin-Watson test was carried out to check the autocorrelation. The Durbin-Watson statistic reported no autocorrelation at a 5% level of significance for seven observations and one explanatory variable (d = 2.345). After running the regression, I got the following result:

$\ln Egg_t = 4.97 - 0.0012\ Fish_t + 0.00616\ D_t$ (F= 1.153, p = 0.402)

(t=18.64, p= 0.000048) (t= -1.48, p= 0.211) (t= 0.117, p=0.91)

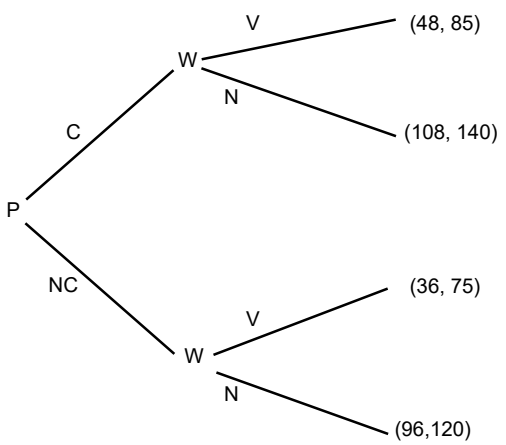
Except for the intercept, neither the model nor the slope coefficients turned out to be significant. If the coefficient of the dummy variable were substantial,

we would say that egg prices during disaster years were 0.62% higher than those during calm years.

For 2020, we witnessed egg prices hit an all-time low in the last ten years. Unfortunately, our market conspicuously lacks a mechanism for hedging against volatility. Moreover, in a corrupt country like ours, disaster compensation may often fall into the wrong hands, mocking the steps to aid victims. As noticed, microcredit borrowers often receive compensation during bad times due to their attachment to institutional lenders. By the same token, if we develop some institution in the farming and agribusiness model, we will ensure just prices for our farmers and insulate them from any volatility from man-made or natural disruption.

Game theory helps us better grasp this point. Here, I present a sequential game. Pairs of numbers in the game tree represent payoffs to poultry farmers (P) and wholesalers (W). Poultry farmer has two choices to make: to make a contract with an institutional distributor to sell their eggs at a negotiated price in the future (C) or not to make the contract with an extensive distributor (here, "distributor" and "wholesaler" are synonymous) and rely on the usual middlemen (NC). Meanwhile, wholesalers choose to offer the normal market prices (N) or the volatile market (V), reading the market demand.

Figure 1: Game Tree



Source: *Author's estimation*

The first number in the pair represents the price received by the poultry farmer by selling dozens of eggs. The second number represents the payoff to the wholesaler by selling a dozen of the egg.

Two critical criteria for determining the outcome of the game are (Khalil,2006):

- Provided that what the others have chosen, a player's decisions must be optimal.

- At the time decisions are taken, they are optimal for the decision-maker.

Looking at the game tree, we realise that for two subgames, there are two Nash equilibria (Varian,1992). If a poultry farmer chooses no contract with a big distributor, then the wholesaler's optimal decision will be to offer the normal market price. (96,120) is the equilibrium here. Because Tk 120 is greater than Tk 75 for the wholesaler. If the poultry farmer contracts with a big distributor, then the wholesaler's response will be to go for a normal market price offer. Here the Nash equilibrium is (108,140).

For a poultry farmer, a present decision depends on his future returns. He will compare his returns under two states. He will notice that a contract will fetch him Tk 108, and no contract will get him Tk96. Moreover, volatile prices (Tk 48 > Tk 36) are higher under contract. Since Tk 108 under contract-normal market price is higher than Tk 96 under no-contract –normal market price, his optimal decision will be Tk 108. So poultry farmer looks forward but reasons backwards. When the poultry farmer chooses the contract, th e wholesaler will go for the normal market price, Tk 140. So (108,140) is the subgame perfect equilibrium here.

Underlying assumptions here in this discussion are— there are many big distributors (including the government-backed-one) apart from middlemen; returns under contract with distributors are higher than those under no-contract. Moreover, if the government wants to send compensation for any disaster, it can do so through the distributors.

Anyone could become a big distributor. Egg cooperatives, TCB, a public listed company or a big local group, could easily vie for a big distributor. Govt has to ensure that there are many of these distributors and they operate under specific laws.

The key takeaway of this discussion is that big distributors are needed in agribusiness to protect the farmers from volatility and uncertainty. Their presence will ensure just prices for the farmers and flawless help distribution of compensation in a disaster-like situation.

3. Limitations and conclusion

Though my attempt to see the change in consumption and prices of protein during disaster years has not turned out to be a success, adding more data to the effort could lead to a different outcome. The Game Theory has underscored the big distributor's role in minimising risk in the crisis. But the idea of big distributors should be preceded by new laws or fine-tuning of existing ones. Laws demarcate do's and don'ts for the parties in a crisis-like situation and dispel any ambiguity. Value-adding nature of agribusiness and the involvement of informal investors calls for more excellent government protection. Laws should be attuned to these ground realities.

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