

MODE OF PRICE FORMATION FOR PELAGIC SPECIES AND EXPLOITATION PROSPECTS IN THE LESS PRODUCTIVE UPWELLING ZONES

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Abstract

Eighty percent of pelagic species are processed into fishmeal for feeding animal. The fishmeal market is a highly internationalized and very competitive market.

Depending on the size of the pelagic stock, the level and variability of catch, the conditions of exploitation and the profitability of the fishery can be very different. Faced with this diversity of situations, the unification of the fishmeal market, product homogeneity and the competition on the market impose a near-identical price on processors who pass on this constraint of profitability - if not one of existence on the market - to fishermen. Any fishery whose production costs would be too high is excluded from this prospective market.

This article presents the results of an econometric study on fishmeal price formation showing to what extent fishmeal prices are influenced by prices of complementary and substitute products for the animal feed industry and discusses the consequences of exploitation possibilities for a pelagic resource, in particular that of the Ivorian-Ghanaian upwelling.

Résumé

Les espèces pélagiques sont destinées à 80 % à la la transformation en farine de poisson pour l'alimentation animale. Le marché de la farine de poisson est une marché très internationalisé où s'exerce une très forte compétion.

Selon la taille d'un stock pélagique, le niveau de capturabilité et la variabilité des captures, les conditions d'exploitation et de rentabilité d'une pêcherie peuvent être très différentes. Face à cette diversité des situation, l'unification du marché de la farine de poisson, l'homogéité du produit et la concurrence qui règne sur

ce marché impose un prix presque identique aux transformateurs qui répercutent cette contrainte de rentabilité, sinon d'existence sur le marché, sur les pêcheurs. Toute pêcheurie dont les coûts de production seraient trop élevés est exclue de ce débouché possible.

Cet article présente les résultats d'une étude économétrique sur la formation des prix de la farine de poisson, montrant de quelle manière les prix de la farine de poisson sont déterminés par les cours de produits complémentaires ou substitués pour l'industrie de l'alimentation animale et discute des conséquences quant aux possibilités d'exploitation d'une ressource pélagique en particulier celle de l'upwelling ivoiro-ghanéen.

1. Introduction

Seafood markets have certain particularities which are not found in any other sector of activity. The main reason for this specific nature is the fact that supply is uncertain and does not depend in the short term on price evolution. Production comes from fishing and not preeding activities, competing for a common wild resource in an area that cannot be appropriated. It is strongly influenced by uncontrollable environmental and biological factors. Unlike agricultural products which are equally subject to climatic accidents, catches are daily without any possible anticipation of «harvest». Only average catch forecasts can be made without account being taken of the very strong variability and non-anticipation of a rising or falling trend. Depending on the degree of processing: fresh, smoked or dried, frozen, canned or fishmeal, the storage possibilities are very diverse, from nil to several years. The diversity of species and products leads to fragmentation into very interdependent micro-markets.

It is not by any chance if fishing remains an independent and artisanal activity. All over the world there is a similar organization of production whereby the financial risk is managed by a system of distribution of gains. The impossibility of forecasting the day's revenue, the proceeds from each trip or long term investments poses a great challenge. This challenge also includes braving each time the dangers of the sea and its sometimes fatal accidents and is found in the consumer and savings behavior of fishermen who do not know what tomorrow holds for them.

In order to develop, it is necessary for every productive activity to be able to forecast and draw up future plans. A stable environment and a minimum of information are necessary for certain anticipations leading to a decision. The market, through prices, functions to reveal information on the area of activity concerned, but for seafood, due to the exogenous nature of supply, this role of the market remains very limited.

2. The special place of pelagic species

With these characteristics, common to marine species, pelagic species have a special place. They are, on the one hand, species that are strongly conditioned by environmental factors and are subject to much instability. The fluctuation of stocks and availability of these species are legendary for their magnitude. On the other hand, they are the most productive species of the oceans and therefore the object of the main fishing activity - more than half of the world catch. They are highly characterized by their use: 80% of the pelagic catch is processed into fishmeal and the rest sold in fresh, smoked or canned form.

In the seafood market panorama, fishmeal is a very different product. First, by its industrial destination and the fact that it feeds a single market: cattle or domestic animal feed industry and more recently aquaculture. But it is also a relatively homogeneous processed product in which the different species (sardines, anchovy, mackerel...) no longer appear. The uniqueness of the market and product homogeneity wipes out the factors of differentiation which, upstream, cause a segmentation into micro-markets and, downstream, reflect the particular conditions of the fishery. Unified and largely internationalized, the market is subject to strong competition where the conditions for local production and the particular nature of the different dynamics of the various species concerned can no longer be seen.

3. The World Fishmeal Market

Global production of fishmeal is about six million tons, representing 30 million tons of fresh products. Half of this production is exported. There are three large production zones: South America (Chile, Peru), Scandinavia (Denmark, Iceland, Norway) and the Far East (Japan, China, Thailand). But only Chile, Peru and the Scandinavian countries export their production. They account for 90% of world market supplies. Though Asian countries are large producers, they are importers on the world market. West and Southern African countries and to a lesser extent Ecuador, Mexico, Canada and the United States are also producers but with little or no participation in world trade. European countries have for a long time been major importers, especially Germany and Great Britain but for two or three years now China has become the largest importer and, with the growth of the Japanese market, there is a shift in trade to Asia.

Final demand for this product is strong no matter the price fluctuation. The market is rationed by supply. The production uncertainty and the price movements it causes, would lead to speculative buying or holding of stocks on the part of buying firms but this is little known. Storage possibilities are however quite limited - three to four months without alteration of product.

This market is relatively not organized. There are no futures market or stock exchange quotations for fishmeal. There is no public information like "market price" but only transaction prices which remain confidential. Sale contracts are established in isolation through bilateral discussions, directly between fishmeal producers and about 30 operators working for cattle feed industrialists. No major

international trading firm is involved in this trade. However, fishmeal exports are comparable in value to tea exports. A number of minor agricultural products traded globally are better «regulated». This may be explained by the particular nature of the product. Annual fishmeal production is limited by the catch and therefore by the availability of stocks of pelagic species which depends largely on uncontrollable factors. The narrow link between the level of pelagic resources and fishmeal production introduces considerable instability on the market making it extremely complex. This naturally-induced instability cannot be mitigated by usual market operations and only economic operators directly concerned are able to manage as efficiently as possible this complexity, by eventually playing on the modification of food manufacture. The importance of this market and the uncertainty surrounding it led to the establishment of a producer association: International Association of Fishmeal Manufacturers (IAFMM) based in London and an exporters association: Fishmeal Exporters Organization (FEO) based in Paris which prepare statistics at different levels of the market. The aim of the FEO is to help isolated fishmeal manufacturers in their discussions with buying firms in order to obtain a better selling prices. But for three years now, FEO has been systematically supplying its members each week with information on quantity sold globally and average quotations, on the production trade as well as a monthly market analysis. Although the market is rationed by supply, strong competition among exporters does not allow them to control the market. The beginning of organization ushered in by the establishment of FEO has not really changed the balance of relationships which remains tipped in favour of operators working for powerful industrialists who know how to play on differences in the quality of fishmeal on the market to divide the producers.

4. Mode of Fishmeal Price Formation

A traditional link is established between soybean market trend and that of fishmeal. The reason for this price interdependence for two products with very different production and market conditions is the fact that the buyer is the same for the two products. Fishmeal has for long been considered a competing product for soybean. This is no longer the case with the improvement in processing techniques which make fishmeal an animal protein concentrate and therefore without much in common with soybean cake. Future competing products likely to affect the fishmeal market are rather synthetic products or meatmeal, a quartering by-product of little value so far but whose production is technically controlled and is beginning to be quite important in Europe. It is only for health reasons (presence of salmonella) that meatmeal is no longer competitive on the market. There should no longer be any major reason for such a link between fishmeal and soybean cake. It is observed that the prices of the two products follow the same trend, with the price of fishmeal reproducing the soybean cake cycle and amplifying it.

A recent study made it possible for us to integrate soybean and fishmeal markets. The data used are CIF price quotations of Reuter, Rotterdam basis, for

soybean cake and Hamburg basis for fishmeal. We have been able to bring out the two different mechanisms in the long term link between the two series of prices. (Figures 1 and 2)

There is on the one hand a direct causality effect of soybean cake price variations on fishmeal prices. Any «shock» on soybean cake prices, like a too good or too poor soybean harvest in the USA or Brazil, largely determines fishmeal price variations irrespective of any other factor. A development of this work should enable us distinguish real effects (physical shock on soybean market) from speculative effects. Speculation is not absent from the market. It is the very uncertainty resulting from the difficulty in predicting supply which fuels speculation on the market. The «confidentiality» of the fishmeal market, which is weakly transparent in the absence of true market organization, reduces data on which price anticipation can be based. Soybean is part of the «market-environment» of fishmeal and it is much easier to anticipate soybean cake price variation, a more transparent product for which the means of forecast are available. Fishmeal price anticipation is based on information available on the soybean market. It is therefore as an environmental variable and a forecast support that soybean cake, acting as a speculative reference determines fishmeal price variations. These «anticipations» produce part of the price changes. They have real effect on the evolution of the level of prices.

There is on the other hand an indirect fishmeal price causality effect on prices of soybean cake. For soybean and fishmeal the final buyer is the same. It has been possible for us to bring out the long term balance of relations between these two series which reveal this common demand. There is a fixed price ratio which expresses the complementary relation between soybean and fishmeal. Relative demand variations can therefore be measured. Fishmeal and soybean cake are complementary in the manufacture of feed as energy and protein components. Fishmeal manufacture is not always done to a fixed quantity ratio of animal and vegetable protein with a cost which can vary with the price trends of these two products. The sums at stake in this industry are enormous and the profit differentials made from the yield resulting from the growth of the animal are relatively small. There is to some extent an adjustment of the quantities used for these two types of protein depending on their price trends - a change in the formulation of the product in order to maintain a lesser and more stable global unit cost. A measure of substitution of the two types of protein is possible. It is in value that the combination of these two factors remains fixed. Any difference with the equilibrium price ratio causes a modification in the quantities demanded.

It is interesting to see that any deviation from this equilibrium - a change in soybean cake and fishmeal prices affects only soybean cake prices, in a negative sense. If the «costs of feed» rises, demand falls and soybean cake price increases.

It is in this sense that fishmeal prices influence soybean cake prices: any rise or fall in fishmeal prices as compared to soybean cake prices causes a change in the quantity of soybean cake demanded and consequently a modification of the price. On the other hand, fishmeal prices do not react to changes in relative

demand. This means that fishmeal market is regulated by supply and adjustments in demand are made on soybean cake whose market supply is excessive, with prices very sensitive to demand fluctuations. Over this period studied (1977-1992), fishmeal remained undervalued as compared to soybean cake prices thus exerting a downward pressure on soybean.

Finally, it is important to point out that the impact of fishmeal price variations on that of soybean cake is negative whereas soybean cake price variations positively influence fishmeal prices. The two prices act mutually and influence fishmeal prices. The two prices act mutually and influence each other, with the two causality effects tending to cancel out. They stabilize within a common range with the stabilization due simply to effects of interactions between prices reflecting the interdependence of these two products. Fishmeal checks the «normal fall» of soybean cake prices which prevent a «normal rise» - this conforms to market data on fishmeal prices.

5. Landing Price of Pelagic Species and Fishmeal Quotations at Hamburg.

Fishmeal production, conditioned by supply, does not adjust to variations of offer prices. Storage possibilities, which could make it possible to play on the level of prices or to control somewhat the selling price, are limited. Like for all seafood, since supply is either limited or abundant, the level of demand is a determining factor in fixing prices. But it has also been shown that fishmeal prices, as quoted in Hamburg, are also determined by factors which have nothing to do with product demand. The evolution of the common agricultural policy and the consequences of the Blair House Agreement suggest that cereals may be substituted for soybean cake in the manufacture of cattle feed. It is therefore more in relation with cereals that one must analyze the fishmeal price trend. Fishmeal prices therefore depend also on political factors remote from its market conditions and even more on the profitability of a particular fishery.

Is there a link between prices quoted in Hamburg and landing prices ?

The different upwelling zones where these species are caught do not have the same environmental conditions. There is a large dissimilarity between the Pacific zone of Chile and Peru dominated by the El Nino phenomenon producing very large interannual fluctuations and the West African zone market by much more seasonal fluctuations. The size of stocks, their dynamics and catch conditions can be very different and consequently the profitability of the divers fisheries is different.

It is however interesting to know that, whatever the fishing zones, prices paid to fishermen are indexed on fishmeal price quotations made in Hamburg. Producers, through their own calculations convert these CIF quotations into FOB prices and through the application of a predetermined rate arrive at a fixed purchase price to fishermen. The rate is 14.5% in Chile and 8.5% in Peru. This

rule applied also to Morocco when it was a fishmeal exporter. South Africa, which is not an exporter, uses the same method but in a slightly different manner. In these countries, producers run their own fishing fleet and fix the price at which they sell fishmeal to local cattle feed industrialists according to the price established in Hamburg.

The reason for the imposition of an almost common price on fishermen whatever the characteristics and the profitability of the fishery is due, on the one hand, to the opening of markets and to conditions of world competition: since the cattle feed industry is very competitive, industrialists always seek to obtain supplies at good prices on the world market if domestic fishmeal producers are not themselves quite competitive. This behavior causes, upstream, extreme competition between fishmeal producers captive to a single outlet. This finally results in the establishment of a price which, given transport and insurance conditions, can only be identical for all fishmeal producers in different fishing zones no matter their production cost. To remain competitive and continue to exist on the market, producers must keep production cost low. They obviously pass on this profitability constraint to fishermen.

It is on the other hand due to a monopolistic situation: if cattle feed is the only outlet for meal, fishmeal is also in many cases, when the stock exploited is large, the only outlet for producers. As a result they can only accept the prices offered by producers.

Finally, the reason lies in the competition between fishermen for a common resources, which like all natural stock fluctuations, contributes to the unpredictable nature of landings and therefore the exogenous nature of supply. For a fisherman, an abundant catch can be as disastrous as stock scarcity. This exogenous nature of supply compels fishermen to remain captive to whatever markets they have and be subjected to the market price.

This brings out the difficulties that may arise when local logic is in conflict with world logic imposed on all, whose constraints are different from local ones, with the ultimate one lying in monetary fluctuations.

This phenomenon was also brought to light in the case of tuna whose market, canned or frozen, is also highly internationalized. The USA is the main tuna market. There, it is used as sandwich filling and is in direct competition with chicken. Tuna demand is a function of the price ratio between tuna and chicken. As the latter is directly indexed on cereals, tuna price is directly indexed on the price of cereals. The selling price of tuna by the tuna fleet, no matter the yield from the zone exploited, is fixed by American demand which obliges it to monitor cereal prices.

6. Conclusion : what type of exploitation for zones of less biological productivity ?

The problem of fishery management lies in the relation between the size of the available stock and the absorption capacity of the target market. As the stock size fluctuates naturally, imbalances are frequent and can sometimes lead to serious economic crisis.

In a closed economy, it is rare to find the desired equilibrium. If the stocks are too large, they will probably remain underexploited. If they are smaller than local demand, the fishing effort will be very intense. When a convenient system of exploitation is found, there will also be, and to a certain extent, a modulation of the fishing effort in such a way that quantities landed adapt to local absorption capacity and not to price trends as is the case in other sectors of activity, where prices reveal in fact an unknown demand trend. The complexity in the fishing sector is due, on the one hand, to the fact that supply can be unpredictable and sometimes abundant whereas the absorption capacity has a fixed limit established on the basis of an average level landing and, on the other hand, to the fact that market action is daily. Prices react to imbalances. The extreme speed of market reaction and its daily variation do not permit the use of prices as a signal to readjust supply to demand. On the other hand, the physical size of the market is generally known. The equalization of the balance of relationships between fishermen and fish merchants or producers is through the adjustment of quantities. When as compared to the market, the yield is large (and the stock also), fishermen will tend to limit their catch as they will anticipate a strong price fall and therefore of their income. The logic of this behavior goes against good stock management as seen from the biological angle.

It is interesting to know that in Morocco where there is a large pelagic resource largely intended for canning, prices are fixed at the beginning of the season through negotiation between canners and fishermen. This type of management is often seen in canning, an industry where there can be major financial constraints and where it is necessary to make a regular minimum contribution. It removes the market price, preferring a contract price aimed at avoiding conflicts between fishermen and canners who despite mutual dependence have resolutely antagonistic interests.

The different types of processing make it possible to liberate fishermen from the narrow and local fresh product market and to make them exploit better these resources. But this will only increase the size of the local market, provide that the absorption capacity of these processing centers is not too rigid.

An open economy makes for less dependence of fishermen on the local market. It also permits full exploitation of a resource when it is abundant. It is the case in Peru and Chile. Without the world fishmeal market, these marine resources would have no market value and would not be exploited. This makes it possible to avoid the quantitative rationing on markets. But it has been seen that in this case there is a certain fixity of the price offered to fishermen irrespective of the yield and the production cost. This price is fixed with reference

to the most profitable and largest fishery and leader on the market and also as a function of prices of competing or substitute products. A kind of world specialization is taking place. Any unprofitable fishery at this level of international price cannot exist on the market of the product concerned and must shift to a more local and limited market or to another product. Since different stocks do not offer the same profitability conditions, they cannot compete on equal terms on a market that is being unified.

The question is resource enhancement and, for fisheries, the uncertainty surrounding long term investment decisions concerning the fleet and especially, upstream, processing industries if they have to adapt to stock exploitation possibilities. The stock size and its variability are important parameters and it is quite difficult to make long term projections on the size of the stock being exploited. Certain stocks have a critical size, not sufficiently large or having a too strong variability for long term large investment decisions, and too large for a reduced market.

In West Africa, the seasonal nature of upwellings confers a particular character on pelagic fisheries which are very different from leading fisheries on the world fishmeal market. Morocco and Mauritania have very large resources but Senegal, Ghana and Côte d'Ivoire have much more average-size stocks. These countries do not have sufficient pelagic resources to compete with Chile, Peru or Scandinavian countries on the very competitive fishmeal market intended for animal feed which accounts for about 80 percent of the total use of the world pelagic catch. But they are lucky to belong to a continent where pelagic consumption is high and there is a supply deficit. The African market also has the largest growth potential. It is on this segment of human consumption - the most profitable pelagic market - that these countries are well placed. This enormous regional market available to them frees them somewhat from world competition and profitability constraints of the animal feed market. Moreover, food habits of the region give preference to salted, dried or smoked products. This mode of preservation has the advantage of being much more flexible than cannery which requires heavier capital and is less extensible. West Africa's pelagic resources also show a very strong variability and this mode of preservation is very well adapted to supply variability. As the investment required is small, it is easy to rapidly increase processing capacity or on the contrary it is less penalizing to leave it idle. Dried, smoked or salted products offer the best possible enhancement of pelagic resources from the point of view of stock as well as profitability of fisheries.

The only problem of this configuration is the risk overexploitation where, faced with limited resources, there exists a large regional demand offering conditions for profitability.

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CAPTIONS OF FIGURES

Figure 1 : Volume of exportations MT and prices of fishmeal (VS/MT) 1878 - 1993. Data of Hamburg market.

Figure 2 : Prices (US/MT) of fishmeal Hambur market and soybean cake (Rotterdam Reuter)

Exportations et prix de la farine de poisson

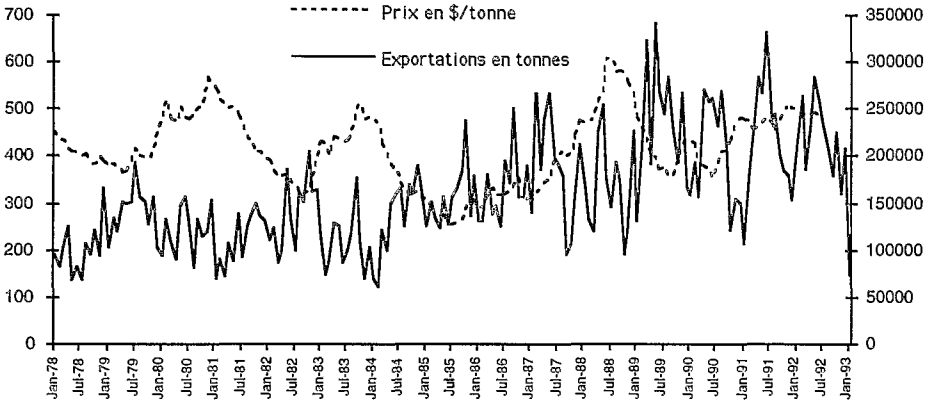


Figure 1 : Volume of exportations MT and prices of fishmeal (VS/MT) 1878-1993. Data of Hamburg market.

Prix de la farine de poisson et du tourteau de soja en \$/tonne

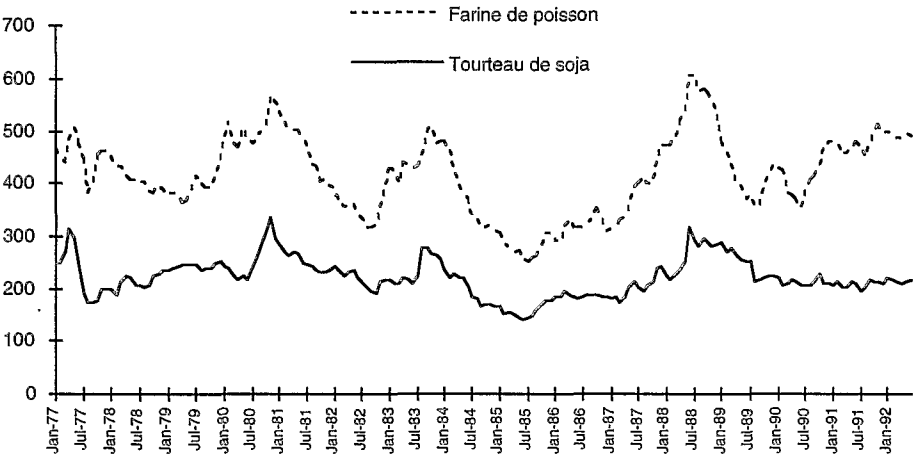


Figure 2 : Prices (US/MT) of fishmeal Hambur market and soybean cake (Rotterdam Reuter)