

Michaelowa, Katharina

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Katharina Michaelowa\*

# International Commodity Policy in Transition

## Does Price Risk Management Open up New Prospects?

*Economists have long been questioning the usefulness of the traditional, highly regulatory international commodity policy. In recent years, the failure of this policy has become evident. Could price and earnings stabilisation through price risk management instruments represent a viable alternative?*

Commodity price and earnings increases and stabilisation are among the long-standing and constantly repeated aims of developing countries, summarized at the UNCTAD Conference in Nairobi in 1976 as the "Integrated Programme for Commodities". After long and controversial discussions, in 1989 the "Common Fund for Commodities" was created as an independent international organization to support these aims. Through its First Account, buffer stocks coordinated within the framework of international commodity organizations are to be supported, whereas its Second Account shall contribute to the financing of other measures in the field of commodity policy. The Second Account is today supporting promising commodity oriented projects, for instance in the field of product diversification. The First Account, however, has so far shown no activity at all. Its tasks contradict the current tendencies of international commodity policies. During the last few years, not a single international commodity agreement has been signed which would be suitable for First Account financing. Today the International Natural Rubber Agreement is the only international commodity agreement left which possesses buffer stocks, thus fulfilling the conditions for First Account financing. This development has basically been caused by the negative experiences with market regulating commodity agreements during the second half of the 1980s. This period brought the failure of the market regulating instruments of the three international agreements for tin, cocoa and coffee. Especially for tin and coffee this failure was accompanied by a strong and sudden decrease in commodity prices, more than offsetting any positive short run effects of the agreements

— as far as such positive effects were noticeable at all. As market regulating mechanisms like international buffer stocks and export quota systems are always prone to fail in the long run, new agreements according to the old patterns of market regulation will be no more successful than their predecessors. Regulation having proved counterproductive, market related measures should now be devised to help third world commodity producers and exporters to achieve their price and earnings objectives. The increase in the prices of several commodities during the last few months should not divert from this long-run necessity.

The increasing globalisation of financial, capital and commodity markets and the introduction of new information technology has provided scope for the efficient use of a series of innovative financial instruments in recent years. This provides new opportunities for commodity producers and exporters, since they can reduce their risks considerably by exploiting the characteristics of the various instruments:

□ Futures and forward transactions enable individual commodity exporters and producers to fix the price of their products in advance, in other words before the actual date of sale. The *forward contract*, which is tailored to the transaction in question by the two parties, makes it possible to sell the product itself directly at a pre-determined time and price. Prices can also be covered by hedging, however. *Futures contracts*, which are standardised and hence more easily traded, are more appropriate for this purpose than forward contracts; in order to cover the price of an underlying transaction in physical products, a commodity producer sells futures at a price corresponding to the expected future price of the physical product. On the delivery date of the commodity the producer receives the market price prevailing at that time. If the market price has fallen since the futures contract was concluded, the loss on the physical

\* Hamburg Institute for Economic Research (HWWA), Hamburg, Germany. This essay is based on the findings of the report on the Common Fund for Commodities and special commodity agreements produced jointly by the author and Dr. Ahmad Naini under the direction of Manfred Holthus for the German Ministry of Economic Affairs. The report, entitled "Der Gemeinsame Fonds für Rohstoffe und die speziellen Rohstoffabkommen", will be published by NOMOS-Verlag.

transaction can be offset by a profit on the futures contract, provided the behaviour of prices on the futures market is broadly in line with that of the physical good. If the market price of the physical good has risen, the profit on the physical contract would be cancelled out by a loss on the futures contract. In order to hedge prices over a long period, several futures contracts can be concluded in succession (termed "rolling over").

□ *Swaps* are the most appropriate instrument, however, for hedging prices over several years, as long as 25 years in some cases. Swaps are purely financial instruments that provide for no physical delivery but for claims or liabilities to be exchanged forward between two parties, often producers and banks or consumers and banks. For example, in order to secure his earnings, a commodity producer pays his receipts based on variable prices to a bank, which in turn pays the producer an amount based on fixed prices. In this way the producer's receipts can be stabilised over the long term. Swap transactions can also benefit a commodity producer by increasing his creditworthiness and attracting investors, who expect a regular dividend payment.

□ *Options* are also among the most important instruments of risk management. They have the same contractual elements as futures or forward contracts, but with the difference that there is no obligation to perform the contract at a particular time, only a right to exercise it during the option period. This instrument can be used to guard against adverse price trends without at the same time having to forgo profits if prices rise.

### Theoretical Assessment

For the sake of simplicity, the following theoretical analysis does not examine the various risk management instruments separately. However, an assessment of swaps and options can be deduced indirectly from the findings with regard to futures and forwards here presented.

The total earnings level of a commodity producer dealing in futures or forwards results from the combination of the physical and the futures or forward transaction, and is thus expressed by the equation

$$y^h = p_k(q - q_f) + p_f q_f = p_k q + (p_f - p_k) q_f,$$

where

$y^h$  = income if he engages in hedging

$p_k$  = spot rate

$p_f$  = forward rate

$q$  = total output volume

$q_f$  = volume sold forward.

The variables  $p_k$  and  $q$  are still unknown when the decision regarding  $q_f$  must be taken. If it is assumed that

the forward rate reflects expectations as to the future spot rate, then:

$$p_f = E(p_k).$$

In this case, the futures (or forward) market is said to be unbiased. The expected earnings are then given by:

$$E(y^h) = E[p_k q + (p_f - p_k) q_f] = E(p_k q).$$

The expected earnings are therefore the same with and without hedging. This is an important difference to commodity price stabilisation by means of buffer stocks, which can induce a change of expected earnings in both directions, depending on supply and demand elasticities and fluctuations in supply and demand.<sup>1</sup> Hedging in unbiased markets is inappropriate as an instrument for increasing earnings. If, in addition, forward markets are biased because speculative profits cannot be eliminated by arbitrage owing to a lack of liquidity in the market, then

$$p_f < E(p_k) \quad \text{or} \quad E(p_f - p_k) = b < 0,$$

and hedging even leads to a systematic reduction in earnings. The absolute value of  $b$  (backwardation) is then to be seen as a risk premium.<sup>2</sup> In principle, a positive bias ( $b > 0$ ) is also conceivable, for example because of transaction costs; then there will be systematic increases in earnings. Using statistical tests, Hughes Hallet and Ramanujam<sup>3</sup> have found a significant positive bias at the 5% level for jute, coffee and copper. According to UNCTAD, however, the problems of illiquidity and the associated danger of systematic losses tend to predominate in the commodity markets.<sup>4</sup> The question now arises as to the importance of hedging for the stabilisation of prices and earnings. Hedging must clearly be shown to be a suitable instrument in this regard in order to offset its possible negative effects on expected earnings.

During the period covered by the forward transaction, *price stabilisation* can be achieved fully by means of hedging, but only in respect of the volume specified in the contract. As the world market price is not affected, as it is by the use of international buffer stocks, for many commodities—in particular for agricultural products—part of total output continues to be subject to price fluctuations due to fluctuations in output. However, price stabilisation is

<sup>1</sup> Wolfgang Maennig: Die Effekte der Preisstabilisierung auf internationalen Rohstoffmärkten auf Erlöshöhe und -stabilität, Volkswirtschaftliche Schriften, No. 359, Berlin 1985, pp. 54 ff. and 86 ff.

<sup>2</sup> D. M. Newbery and J. E. Stiglitz: The Theory of Commodity Price Stabilization, Oxford 1981, pp. 184 f.

<sup>3</sup> Andrew J. Hughes Hallet and P. Ramanujam: The Role of Futures Markets as Stabilizers of Commodity Earnings, in: L. A. Winters and D. Sapsford (eds.): Primary Commodity Prices: Economic Models and Policy, Cambridge 1990, p. 210.

<sup>4</sup> See for example UNCTAD: A Survey of Commodity Risk Management Instruments (UNCTAD/COM/15), Geneva 1993, p. 21.

subordinate to the objective of *earnings stabilisation*. If price stabilisation does not lead directly to earnings stabilisation, as it does if the volume of output and sales is certain, the objective of earnings stabilisation should, if possible, be examined directly.

### Earnings Stabilisation

A commodity producer who wishes to minimise fluctuations in his earnings, as expressed by the income variance, faces the minimisation problem

$$\min_{(q_f)} V(y^h) = \min V[p_k q + (p_f - p_k) q_f].$$

The variance of earnings is a convex function of  $q_f$  with a unique minimum at point  $q_f^*$ . As  $q_f = 0$  is an option that can always be chosen, when  $q_f^* \neq 0$

$$V[y^h(q_f^*)] < V[y^h(q_f = 0)] = V(y),$$

where  $y$  is the producer's income if he does not undertake any forward transaction. Hedging to the level of  $q_f^*$  therefore almost by definition has a stabilising effect on earnings. In the literature this result is usually deduced mathematically.<sup>5</sup> It holds good irrespective of whether the markets in question are biased or not, as the variance to be minimised is not altered if the forward rate is a biased estimator of the future spot rate ( $b \neq 0$ ).<sup>6</sup> In general, this can be attributed to the fact that the variance of an aggregate is unaffected by the addition of a constant. The following applies:

$$\begin{aligned} V(y^h) &= V[p_k q + (p_f - p_k) q_f] \\ &= E\{p_k q + (p_f - p_k) q_f - [E(p_k q) + b q_f]\}^2 \\ &= E\{p_k q + [(p_f - b) - p_k] q_f - E(p_k q)\}^2 \\ &= V[p_k q + (p_f^o - p_k) q_f], \end{aligned}$$

where  $p_f^o = (p_f - b)$  again represents the unbiased estimator of the spot rate, i.e. the previously assumed forward rate in the unbiased market.

Where earnings stabilisation conflicts with the other two objectives examined above, the objective of price stabilisation will probably fall well down the order of priorities, while the producer will seek a trade-off between the level of earnings and earnings stability that accords with his personal preferences. To that end he will maximise

his utility function, in which the degree of personal risk aversion is a not inconsiderable factor. On the assumption of constant absolute risk aversion, such utility maximisation is demonstrated in an exemplary manner by Newbery and Stiglitz.<sup>7</sup> In this way each producer can achieve a different optimum volume for the forward transactions he undertakes. Overall, he will never be in a worse position than in the situation without the possibility of hedging, as he is always free to choose the volume nil. The promotion of well functioning forward markets can therefore only be of advantage for commodity producers.

### Problems of Non-stationarity

One problematic aspect of hedging lies in the choice of period over which the price is to be hedged. McKinnon<sup>8</sup> assumes that a forward transaction can always be projected far enough into the future to cover the period of greatest price fluctuations. The behaviour of commodity prices over the last few decades, however, casts doubt on the validity of this assumption. Instead, the question arises whether prices might be non-stationary, following a random walk for instance. If so, the price cannot be expected ever to return to its point of departure once it has first deviated from it. Hence, even if the volume of output is certain, complete price and income stabilisation will be possible only if the forward transaction can be concluded to run from the first to the last period of the producer's or exporter's activity or can be rolled over for that time-span. However, the third-world producer or exporter probably does not know when that period will end when he takes up his activity. If successive generations who take over the activity from their parents are also included in the risk minimisation calculation, hedging would have to be carried out for an infinitely large number of periods. Even if taking account of transaction costs and discounting to present values leads to a period of less than infinity over which optimal hedging takes place, the number of periods is still relatively high, given realistic assumptions about all other values.<sup>9</sup> As a random walk, the price for each period  $t$  ( $p_t$ ) is given by the price for the preceding period ( $p_{t-1}$ ) and an independent, identically distributed error term ( $u_t$ ) with an expected value of nil. Hence  $p_t = p_{t-1} + u_t$ . The variance of  $p_t$  after  $\tau$  periods is given by:

$$\begin{aligned} V(p_t) &= V(p_{t-1} + u_t) \\ &= V(p_0 + \sum_{t=1}^{\tau} u_t) \\ &= \tau \sigma^2, \end{aligned}$$

where  $\sigma^2 = V(u_t)$  for all values of  $t$ , and  $p_0$  is the known price for the initial period.

The variance of the price for the final period therefore rises in direct proportion to the increase in the number of

<sup>5</sup> See for example Andrew J. Hughes Hallet and P. Ramanujam, *op. cit.*, p. 191.

<sup>6</sup> *Ibid.*, p. 192.

<sup>7</sup> D. M. Newbery and J. E. Stiglitz, *op. cit.*, pp. 184 ff.

<sup>8</sup> R. I. McKinnon: Futures Markets, Buffer Stocks, and Income Stability for Primary Producers, in: *Journal of Political Economy*, Vol. 75, 1967, p. 852.

<sup>9</sup> K. M. Kletzer, D. M. Newbery and B. D. Wright: Alternative Instruments for Smoothing the Consumption of Primary Commodity Exporters, World Bank Working Paper 558, Washington 1990, p. 64.

periods  $\tau$  over which a forward transaction extends. For an infinite number of periods (i.e.  $\tau \rightarrow \infty$ ),  $V(p_t) \rightarrow \infty$  applies. With increasing variance of the spot rate, the default risk of forward transactions also increases. In the case of futures transactions this risk is covered by means of margin calls. These margin calls must therefore be correspondingly high. As the risk of default, and hence the size of the margin calls, is directly related to the price risk, the calls will become unpayable at some point if the number of periods is very high.

The question whether commodity prices really show non-stationary behaviour is therefore clearly relevant. The available statistical tests (e.g. the Dickey-Fuller test on unit roots) are unfortunately not very powerful, so that there may be a very high probability that a hypothesis (here the hypothesis that a random walk exists) will not be rejected even though it is false. Cuddington and Urzúa<sup>10</sup> examined price series for 24 commodities and were unable to reject the hypothesis of non-stationarity. On the other hand, economic theory points instead to the existence of stable market equilibria with corresponding equilibrium prices, to which prices ultimately return. This apparent contradiction can be explained by the fact that there seems to be a very high but not perfect autocorrelation in the prices of many commodities.<sup>11</sup> In that case commodity prices do not follow a random walk. In practice, however, this means nothing more than that the problems of a random walk are present in a diluted form. Processes with a very high autocorrelation coefficient ( $\rho \rightarrow 1$  |  $\rho \neq 1$ ) are very similar to a random walk for a finite number of periods  $t$ . In fact, this is the reason for the low power of the statistical tests.

Despite these problems in determining the desired stabilisation period, in the context of the theoretical considerations set out above, hedging is to be seen as an interesting new way for third-world commodity producers and exporters to protect themselves against price and income fluctuations at the same time facilitating their necessary medium and long-term planning.

### Problems in Futures Markets

We shall now consider the various risk management instruments separately again in order to show the problems specific to each. For example, for some commodities there are fundamental, product-specific problems in trading on futures markets. Some goods are not suitable subjects of standardised contracts because of a lack of homogeneity. For example, there are so many different types of tropical timber that it has not yet been possible to create a futures market.<sup>12</sup> Even if futures markets do come into being, the standardised contract often does not precisely capture the nature of the product

to be hedged, so that the price behaviour of the future contract may differ considerably from that of the product itself. In such cases the scope for price hedging is greatly restricted. The specification of the standardised contract with regard to place of delivery, contract period, currency and quality of the good seldom meets the particular interests of producers in developing countries, as they have had little say so far in devising the contracts. For example, the developing countries have not been represented so far on the exchange committees of the major commodity exchanges for goods such as coffee and cocoa in the United Kingdom and the USA.<sup>13</sup> As the largest commodity exchanges are situated in industrial countries, direct market access is extremely difficult for third-world producers. The involvement of intermediaries, however, further increases transaction costs and impedes the flow of information.

A further problem, particularly for small producers from developing countries, stems from the above-mentioned margin calls, which are often very large and are issued if price developments make it appear necessary to guard against default. Payment must generally be made in hard currency within only a few days; if the call is not met, the contract is cancelled. This may be another reason why it has mainly been firms from industrial countries that have been active in futures markets hitherto.<sup>14</sup> In addition, many governments of developing countries regard involvement in futures contracts as a danger. To protect themselves and firms from their countries against loss, they often impede participation in commodity markets by means of heavy taxation or unclear legislation, or they even forbid it completely.<sup>15</sup>

The fears on the part of governments are probably based primarily on the possible lack of information. Indeed, external market participants have a transparency problem that is difficult to overcome, even if they accept high information costs. On some commodity exchanges transparency even seems to be impeded deliberately in favour of large market participants. For example, the London trading system encourages the market participation of large investment funds by stipulating that trading positions are reported only after up to 90 minutes,

<sup>10</sup> J. T. Cuddington and C. M. Urzúa: Trends and Cycles in Primary Commodity Prices, Washington 1987.

<sup>11</sup> See also A. S. Deaton and G. Laroque: On the Behaviour of Commodity Prices, Princeton 1989.

<sup>12</sup> UNCTAD: Technical and Regulatory Conditions Influencing Participation in, and Usage of, Commodity Exchanges by Both Buyers and Sellers of Commodities (UNCTAD/COM/16), Geneva 1993, p. 4.

<sup>13</sup> UNCTAD: Technical and Regulatory Conditions ..., op. cit., p. 13.

<sup>14</sup> UNCTAD: A Survey ..., op. cit., p. 19.

<sup>15</sup> UNCTAD: Contribution to the Improvement of the Functioning of Commodity Markets (TD/B/CN.1/10), Geneva 1993, p. 27.

so that the funds need not fear that their market strategy will be identified.<sup>16</sup> Transparency is particularly important, however, if non-trade-oriented market participants, such as investment funds, account for a large proportion of deals on an exchange, as sudden large transactions can lead to high short-term price volatility that has nothing to do with the performance of the underlying real goods market. The German Coffee Association also complains that chartists and investment funds using computer models are having an increasing influence on prices unrelated to the fundamentals of the real market.<sup>17</sup> If there are insufficient independent market participants on both sides of a futures market, the danger of deliberate price manipulation also increases. On several occasions in the past, large trading houses have tried to raise or depress prices artificially by means of large purchases or sales of particular futures (cornering and squeezing).<sup>18</sup> The often inadequate liquidity of some futures markets has already been mentioned; it is particularly prevalent in futures for terms of more than six months<sup>19</sup> and generates not only speculative profits at the expense of hedgers – especially where rolling-over is involved – but also increases the danger of a high concentration of market participants.

### Options, Swaps and Forward Markets

If price performance on the futures market does not correspond to that on the real goods market, it is not only the functioning of the futures market that is endangered, as futures prices are an important guide for trading in options and swaps. If price formation on the futures market is distorted, the swap and options market also often does not operate fully and therefore cannot offer appropriate alternatives for hedgers. A further link between the problems of the futures and swap markets must also be taken into consideration: if financial institutions are risk-averse, they will only offer a commodity producer swaps if they can cover the risk either by concluding another swap transaction with a purchaser of the commodity in question or by concluding back-to-back futures contracts. The second option is a possibility for them only if the futures market is so liquid that hedging entails no systematic losses. Hence, swap contracts will be concluded only if the futures markets are highly liquid.

Hedging by means of swaps or options involves significantly higher transaction costs than hedging by means of futures, owing to the individual nature of the contract and the need to find a suitable counterpart. Like swaps, options have the advantage over futures, however, that no unforeseen margin calls can arise. This has led to an increase in options trading in recent years, despite the often large initial payments required.<sup>20</sup> There are options markets for coffee, cocoa and, since June 1991, tin, but not

for rubber because of lower market liquidity.

The prices of commodities that do not lend themselves to standardised contracts can be protected on forward markets. As there is generally a direct link between the goods transaction and the forward transaction, there is no need to fear the price manipulation problem evident on futures markets. Moreover, the individual nature of contracts ensures that the product being hedged (in terms of quality, place of delivery, etc.) is precisely the product being produced, in contrast to the situation with futures contracts. For that reason, forward markets are also often used for commodities in which there are futures markets.<sup>21</sup> As with swaps and options, the great problem with forward contracts lies in the sometimes very high cost of arranging a contract. A lack of transparency makes it more difficult to find a suitable counterpart. It is obvious that small, possibly unknown firms with a low credit rating, a situation in which many producers from developing countries find themselves, will have particular difficulty finding a partner, because the risk of default is not covered in the forward market. Moreover, banks and trading houses set country-specific exposure ceilings, as they take account not only of the solvency risk of the trading partner but also of the sovereign risk, which is often quite high for developing countries.<sup>22</sup>

### Outlook

It can be seen that the problems facing producers from developing countries desiring to make use of price risk management instruments are indeed considerable. They include transparency and information problems, problems of market structure and illiquidity, problems of credit-worthiness and problems of contract designing. However, many of these difficulties can be overcome or at least greatly reduced by taking appropriate measures. For example, third-world commodity producers and exporters could be given easier access to forward markets through the provision of information and technology transfer in the context of bilateral technical co-operation. The creation of new commodity exchanges in producer countries themselves would also be worth supporting. In the field of multi-lateral co-operation, rules could be worked out that are better suited to the needs of market participants from developing countries. Such rules should form the future basis for trading, at least on the newly established exchanges.

<sup>16</sup> UNCTAD: Technical and Regulatory Conditions ..., op. cit., p. 36.

<sup>17</sup> Deutscher Kaffee-Verband: Kaffee-Bericht 1992, Hamburg 1993, p. 8.

<sup>18</sup> UNCTAD: Technical and Regulatory Conditions ..., op. cit., p. 24.

<sup>19</sup> UNCTAD: A Survey ..., op. cit., p. 21.

<sup>20</sup> UNCTAD: A Survey ..., op. cit., p. 28.

<sup>21</sup> UNCTAD: A Survey ..., op. cit., p. 16.

<sup>22</sup> UNCTAD: Contribution ..., op. cit., pp. 32-33.