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Challenges for the Global Agricultural Trade Regime after Doha

INTERNATIONAL DIVERSIFICATION OF THE ASSET PORTFOLIO BY INVESTING IN AGRICULTURAL COMMODITIES. WHY NOT USE THE CAPM FUTURES MARKETS?

Gheorghe Hurduzeu
The Research Institute for Agriculture Economy and Rural Development
geohurduzeu@gmail.com

Raluca Hurduzeu
Bucharest University of Economic Studies
rehurduzeu@gmail.com

Abstract: The international diversification of assets by investing in agricultural commodities has manifested increasingly in recent years, as demonstrated by the growth in investment in commodities which have augmented rapidly in recent years, the prospect is that they will increase further. The common perception is that international trade markets investments popularity comes from the fact that the goods constitute an alternative asset class with returns that present, at least in theory, low or negative correlation with the returns on assets belonging to traditional asset classes: stocks and bonds. *Harry Markowitz* (1959) and *James Tobin* (1958) developed *the theory of optimal selection of securities portfolios in an uncertain environment*. This was developed by *William Sharpe* (1964) and *John Lintner* (1965) in a general equilibrium model prices. This model completes and improves *Markowitz'*s theory, because even its author *William Sharpe*, leaves in its development, inters alia, on the premise that the investor will use an investment approach as described by his predecessor. Basically the model enables us to facilitate the work in evaluating the expected earnings of the various securities and portfolios, which relates to a risk measure called β. What is particularly important about this model is that it is currently applied in the industry of the investments, maybe not in its original form, but in newer versions adapted of it. However, the researchers concluded that the overall balance given by the CAPM is quite inconsistent in practice. Other authors have attempted to explain the application of CAPM on futures markets. The conclusion was that the CAPM is not consistent in explaining the results of the futures markets, but also the qualitative and quantitative empirical phenomena are unable to explain the results from the futures markets.

Keywords: portofolio, diversification, prices, volatility, risk

1. THE CAPM MODEL – BRIEF CONSIDERATIONS

The general model of equilibrium is generally based on the assumptions (A_1) to (A_7).

(A_1) Investors evaluate the portfolios in terms of the expected earnings profile - standard deviation determined for a well-established period of time.

(A_2) Faced with a choice between two portfolios, otherwise identical, investors will choose the portfolio with the lowest standard deviation.

(A_3) The quantities of all shares are predetermined.

(A_4) All investors have the same perceptions about expected earnings, standard deviations and covariances of the titles.

(A_5) There is a risk-free rate at which an investor may be granted or borrow money

(A_6) The fees and transaction costs are irrelevant..

(A_7) The individual assets are perfectly divisible, an investor may purchase, if so desired, a fraction of a share.

The basic implications of CAPM are:

(CAPM - 1) All investors hold in portfolios all the assets in the same proportions regardless of preferences. Defining the expected gains as the earnings of an asset E(RI) in excess of the risk-free gains, r, the following implication is:

(CAPM - 2) The expected return of the market and risk-free gain ($E(R_i) – r$ is proportional to the expected market gain (E(Rm) – r).

(CAPM - 3) If β_i is the covariance of the returns of the title i with the market portfolio, divided by the variation of the returns of the market portfolio.

This can be defined as:

$$(E(R_i) = r + \beta_i [E(R_m) – r] \quad (1)$$

and

$$\beta_i = cov (R_i, R_m)/var R_m \quad (2)$$

Combining the two implications, the fourth implication is:

(CAPM - 4) the appropriate risk measure for an asset is not its own variance, but the covariance of its rate of profit and the market portfolio.
So the expected rate of gain is equal to the sum of two terms: the risk-free rate of return and an increase compensating for the acceptance of a risky asset. This compensation for beta risk is expressed as a result of the additional asset multiplied by the supplementary result of the market, $E(R_m) – r$. This additional result is called *risk premium*.

The factor β_i is the percentage of the increase in portfolio risk resulting from the marginal increase in the share of the asset *i* has on the market portfolio.

$$\beta_i = \frac{1}{\sigma_m} \frac{\partial \sigma_m}{\partial w_i} \tag{3}$$

where σ_m is the standard deviation of portfolio gains and w_i is the percentange the *i* asset has on the portfolio.

The empirical evidence on the CAPM model testing are inconsistent with the theory (see *Lintne*r, 1965*), Miller, Scholes* (1972), *Black, Jensen et Scholes* (1972), *Levy* (1978), etc.). The research used data sets to estimate the coefficient β_i in the equation (1).

Using β_i derived from the data series we reach:

$$\overline{R_i} = \gamma_0 + \gamma_1 \hat{\beta}_i + e_i \tag{4}$$

$$\overline{R_i} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 \sigma_i^2 + e_i \tag{5}$$

Where $\overline{R_i}$ is the avarage of the earnings for the title *i* throughout the period, σ_i^2 is the variance of the earnings for the title *i*, $\hat{\beta}_i$ is the systemic risk and e_i is the random error associated with the earnings breought by title i.

If the CAPM is valid then the equation (4) must correspond to the equation (1). Thus, the following hypotheses have to be true.

(I_1) The coefficient γ_0 corresponds to the risk-free rate $\bar{r}$

(I_2) The coefficient γ_1 corresponds to the average market earnings minus the risk free rate $(\overline{R_m} - \bar{r})$

(I_3) The coefficient γ_2 in equation (5) should be zero because (CAPM – 4): the only relevant risk is β_i and not the own variation of the title.

The conclusions drawn from the empirical research showed that the CAPM model described in equation (1) are not adequate to the descriptions of the structure of the earnings of the financial assets.

2. USING THE CAPM MODEL ON FUTURES MARKETS

Can the CAPM model be extended to the study of the futures markets, namely the agricultural markets?

The starting point is the risk premium which should be identified on the commodity futures markets. The research is numerous, using various methodologies, data related to different commodities, markets, and time series.

Keynes considered the futures markets the ones on which the traders have commodities and sell futures contracts to transfer the risk of price fluctuations[1]. He believed that futures prices are lower than expected spot prices and therefore the futures prices that should grow to equal the future spot prices when the contract expires. In other words, forward prices, the price is above the spot price, must fall below anticipated spot to at least the sum given by the normal backwardation. *Keynes'*s rationale is simple: excluding the speculative opportunities in a risk-neutral economy, futures prices should equalize on the spot and those traders will be rewarded at maturity. Therefore, the futures price deviation from the expected spot price is given by the *risk premium*, which can increase if traders have long or short risk aversion higher than the counterparty. For example, the farmers should sell futures to stabilize the prices of the next crop. If farmers have a strong aversion to risk, they will be willing to sell futures at a price below the expected spot price for the commodity. If this situation

[1]. In his Treaty on Money, he shows that on the commodities market, there are at the same time two prices - spot and forward prices. For the producer wishing to sell in the future, the main role is played by the forward price. Thus, he/she can eliminate the price risk by selling forward freight before harvesting. If the forward price indicates profit compared to production costs, it can start producing, selling at time and eliminate any risk of price. If the forward price does not cover production costs then there is no incentive to produce in general. This fact, according to John M. Keynes, the forward price plays the role of an indicator for next status of the spot market.
The spot and forward prices can be different depending on the existence of correlations in time, on the spot market, excess or lack of products. If the supply is less, the spot price will be higher than at term. This difference John M. Keynes called it backwaradation. In other words, the state of market equilibrium, the spot price exceeds the forward price to the size of the prize, which they hope to receive speculators. If the offer is insufficient on the spot market, the backwardation can grow. He/ she will be limited to buyer reluctance to pay a price higher than spot to postpone the period of purchase.
The situation in which the price is higher than the spot, Keynes named contango (premium). The size of the premium must be equal to the cost of delivery. The existence of contango does not say that the manufacturer may be subject to a hedging position without paying a premium for the risk. Because of the existence of surplus of products, the market is not in equilibrium, hence the price increase is observed. And because the hedger must pay the risk premium, the forward price must be lower than the expected spot price; otherwise it means that the manufacturer pays a negative price to safety or lack of risk.

persists futures prices fall below the expected spot prices. *Keynes* also believed that hedgers have normal positions as sellers and speculators with positions of buyers.

So, the speculators are on the other side and buy these futures contracts with a *discount* under the estimated price[2]. *The magnitude of this discount is the* ***risk premium*** *required by the speculators*.

Keynes's theory about the 'normal backwardation' was and is the subject of numerous controversies. *Brennan* (1958), *Cootner* (1967) and *Telser* (1958) tried to find out whether the 'normal backwardation' exists. The debate was continued by *Dusak* (1973), *Carter, Rausser and Schmitz* (1983), *Kolb* (1992) and others. *Dusak* (1973) applied the CAPM in an attempt to determine the risk premium that speculators should receive in order to balance other market opportunities.

The purpose of the research was the implication (CAPM - 4) described above. The proper measure of the risk of an asset is not its own variation but the covariation of its rate of earnings with the market portfolio.

As a measure of the risk premium, which is the expected rate of earnings of a futures contract over the risk free rate, we used the discount of futures price $P_f(0)$ below the expected subsequent price $EP_i(1)$ as a percentage of the current cash price $P_i(0)$. This term is given by the left side of equation (6). According to (CAPM - 2) and (CAPM - 3) it must be proportional to the rate β_i, the term of the right side of equation (6).

$$\frac{EP_i(1) - P_f(0)}{P_i(0)} = \beta_i \left[E(R_m) - r \right] \qquad (6)$$

The demanded risk premium is depended on β_i, which measures the systemic risk. Is it positive, as stipulated by *Keynes*?

The *Dusak* model estimates the regression of the equation (7) for futures contracts on wheats, corn and soybeans at CBOT.

$$R_i = \alpha_i + \beta_i R_m + \varepsilon \qquad (7)$$

where R_m is the earning brought by index S&P 500 and R_i is the earning brought by the futures contracts, the term on the left side of the equation (6).

[2] Hurduzeu, Gh. et al. (2002), *Speculatia si acoperirea pepietele la termen de marfuri agricole,* editura RAO, Bucuresti, pp/59-91.

The findings of the research show that both earnings and β_i showed values closed to zero. Consequently there is no systematic risk brought by the futures contracts of the market portfolio. As a result, futures prices should not be trade with a discount and 'normal backwardation' should not exists.

Subsequently, the research of *Carter, Rausser şi Schmitz* (1983) ahave come to opposite conclusions.

Thus:

1. The data is inconsistent with the CAPM model in the sense that γ_1 from (4) has negative values (theoretically, γ_1 should be positive $(\overline{R_m} - \overline{r}) \rangle 0$.
2. This is supported by the *Keynes*'s theory
3. The earnings on futures and equity are the same
4. An investor can reduce the risk without lowering the rate of returns by portfolio diversification, combining the stock with the futures. If we change the portfolio with all stock with one in which we have 60% stock and 40% futures on commodities, an investor can reduce the standard deviation of earnings to one-third without sacrificing the earnings.

Bodie şi *Rosansky* (1980) find positive earnings related to futures positions. Similarly, *Fama şi French* (1987) found positive gains which confirmed *Keynes's* theory.

Carter, Rausser şi Schmitz (1983) explored the systemic risk for futures and found evidence supporting the *normal backwardation*. They chose the contracts on wheat, corn and soybeans as *Dusak*.

Also, *Marcus* (1984) and *Baxter, Connie and Tamarkin* (1985) did not find any evidence related to *normal backwardation* and *Ehrhardt, Jordan* and *Walking* (1987) have extended the research using the Arbitrage Price Theory for futures contracts on wheat, corn and soybeansb and found no evidence about the risk premium.

Chang (1985) uses nonparametric methods to test the existence of the risk premium for the same products. He argues that speculators make profits for these products although the method used did not prove to measure the size of the risk premium.

Kolb (1992) shows that *Keynes*'s theory of normal backwardation is 'normal' but not for all commodities.

CONCLUSIONS

From the studies mentioned above, there are several strong arguments for the inapplicability CAPM on futures markets:

1. An important implication is the model of the general equilibrium (CAPM – 1): the investors take the risk in its portfolio as far as titles are available on the market. This implication does not make sense on futures markets because here we have the number of open positions equally divided between long and short. This makes the net positions to be zero because the number of long positions equals the number of short positions. How can then both holders of both long and short portfolios have the same proportions?
2. The presumption (A3) of the CAPM, such that all titles are predetermined quantities is unenforceable on futures markets. The open positions are determined by the economic conditions of endogenous variables and vary considerably over a month.
3. Almost all open positions are on the closest maturities typically futures contracts with maturities of three months. The futures contracts are 'securities' on the short term, while the shares are long-term transactions.
4. Then the majority of futures market positions are covered to maturity both through purchases and through sales (through offsetting) whereas the transactions are effective shares.
5. More, as many research has shown[3], an investor can reduce risk without reducing their rate gains through portfolio diversification, combining action with futures, by changing a portfolio of all the action with one in which we have 60% equity and 40% commodity futures. Either this is logically impossible. The earnings rate R_i for a long position is minus gains rate for a short position. How can then both long and short holders carry the same risk reduction without sacrificing their expected gains?

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