A Note on Chapter 29 of Keynes's Treatise on Money

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The question posed by Chapter 29 of the *Treatise* is the following: Is it possible, for fluctuations in liquid capital to counterbalance fluctuations in working capital and thus provide the *means* – apart from the *motive* – for a recovery after a slump?

To clarify things let us first give the definitions of working and liquid capital. Working capital is referred mainly to durables such as raw materials and semi-finished goods used as inputs in the production process. Liquid capital is the part of working capital that "exceeds the quantity that *normally* would be held for a given short period production plan and which can be *readily* sold at the spot market"[1](our italics). Note two points in this definition for liquid capital: liquid capital cannot be defined independently of the working capital that a producer would normally hold as an input to his production. "Normality" in this case depends on the phase of the cycle. In a slump, the quantity of working capital held should diminish as production plans along with demand shrinks. Then, if liquid capital is the excess of working capital over what would normally be held, falling working capital stocks should be followed by rising liquid capital stocks. Alternatively, fluctuations in the first would have to be balanced by fluctuations in the second. However, according to Keynes, the stocks of liquid capital at every point in time – and especially at the worst point in the slump – rise less than working capital stocks fall and are quite small to replenish the latter. The most important reason for this relates to the "carrying" costs of these stocks throughout the slump. This is the second and most important point which indicates that this surplus working capital cannot be automatically transformed to *liquid* capital, that is, capital readily sold at the market. In fact, the process of this transformation reveals the functioning and interrelation of spot and forward markets in such commodities used as production inputs.

[1] See Davidson (1978) pp. 103

Carrying costs for staple commodities include: 1) maintenance expenses that would preserve its suitability and quality when demand recovers in the future, 2) storage and insurance costs, 3) interest costs (if stocks are to be maintained with borrowed money) and 4) costs in the form of losses incurred by fluctuations in the money value of the commodity during the time is kept in stock. These factors intervene between the current market price (S_0) and the "anticipated normal price" or the expected future spot price ($E[S_1]$) (if $E[S_1] = F_0$ where F_0 is the forward price, then this is the flow supply price of newly produced output [2]) so as to reduce the former below the latter by an amount sufficient to satisfy the holder of redundant stocks for the costs and risks incurred. These risks are predominantly emerging from the fourth factor and are related to both the risk that the slump might be more prolonged than expected (carrying period) and the future spot price lower than expected. Hence, the transformation of redundant working capital to liquid capital demands a difference between current prices and future expected spot prices that would *induce* speculators and dealers in the market to enter in such contracts with producers[3].

To indicate the complexity of the issue, Keynes provides the following formula for the price fall needed to absorb redundant stocks:

$$pq = xy$$

where: p is the maximum proportionate fall of prices below the normal

q is the proportionate fall of production below the one corresponding to

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[2] See Davidson (1978) pp. 104

[3] These ideas are repeated in Chapter 17 of the *General Theory*. To use the notation of that Chapter for wheat we have $\alpha_2 = \frac{F_0 - S_0}{S_0} = c_2 + l_3$, if $F_0 = S_0 + c_2 S_0 + l_3 S_0$ where c_2 is the carrying cost in the sense of wastage through time and l_3 is the liquidity premium on money which is equal to the interest rate in money market equilibrium and hence, it represents the interest cost. We also assume, as Keynes did, that the yield of wheat in terms of itself and its liquidity premium (convenience yield: the yield derived by the holding of liquid capital) are both zero, i.e. $q_2 = 0$ and $l_2 = 0$. Now notice that if the expected future spot price is greater than the forward price then their difference $E[S_1] - F_0 = \delta$ is the necessary insurance premium against price fluctuations paid by producers to speculators and this should be reflected in a rise of $\alpha_2 = \frac{F_0 + \delta - S_0}{S_0}$. (See Keynes (1936) pp. 223, 227, 228). For a thorough treatment of the commodities' forward prices formation see Thomadakis & Xanthakis (2006) pp. 389-411.

normal equilibrium prices

x is the total annual cost of carrying stocks as proportion of the normal price

y is the proportion of redundant stocks to a year's consumption

In order to understand the formula let us define a as the time needed to absorb redundancy and raise the price to normal levels. If this is the case then $\alpha x = p$ since the product of percentage annual carrying costs times the time needed to absorb redundancy must equal the percentage fall of price to induce the speculator to take a long position. Furthermore, if, during the slump, consumption falls less than production, stocks at the beginning of the slump diminish by q because of the fall in production and by q because of the absorption by consumption (hence, by $2q$ in total). Hence, average percentage reduction of stocks is $q = \frac{y}{\alpha}$. Combining these two equations gives $\alpha = \frac{y}{q} = \frac{p}{x}$ from which the above formula can be obtained given two assumptions: i) that price would rise back to its normal level as redundancy is reduced and ii) the rise in consumption (that absorbs stocks because of their lower price) equals the fall in production (because of this fall in prices).

The above provide the basis for Keynes's theory of the forward market for staple commodities. Keynes defines the forward price as the one contracted today for delivery and payment at a specified future date. This is the price that matters for the producer if it corresponds to the end of the production period. It is the flow supply price F_0 at that date that should cover at least the incurred costs of production. In the case of no redundant stocks in the rising phase of the cycle and due to shortages in supply, the current spot price for immediate delivery will rise above the current forward price for future delivery limited only by the willingness of the buyer to postpone his purchase for the future. In this case we could assume that given increased supply in the future, the expected future spot price must also be lower than the current spot price so as $E[S_1] \approx F_0 < S_0$. This is the case of *backwardation*. The difference $(S_0 - F_0)$ is the *convenience yield* net of carrying costs[4] [5].

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[4] See Milonas & Thomadakis (1997) p. 271 and 272.

[5] If we define the difference $F_0 - S_0$ as the *basis* and l_i the convenience yield of asset i then by Keynes (1936) p. 226 we have $a_i + q_i - c_i + l_i = l_3 \Rightarrow \frac{F_0 - S_0}{S_0} + q_i - c_i + l_i = l_3 \Rightarrow F_0 = S_0 + [c_i - (q_i + l_i)]S_0 + l_3 S_0$.

However, if there is no shortage in supply, the current forward price F_0 must be lower than the expected future spot price $E[S_1]$ by an amount equal to an insurance premium against price fluctuations. In other words $E[S_1] - F_0$ equals the insurance premium paid the producer to insure himself against price fluctuations during his production period. Then a producer can sell its product at the end of the production period to the speculator at a price F_0 determined today and the speculator assumes the risk of a lower future spot price by betting on a positive difference $E[S_1] - F_0$ that would permit him to make an equivalent profit. This is the case of *normal backwardation* with $F_0 < E[S_1] \approx S_0$.[6]

If there exist redundant stocks then, as we show above, the current spot price should fall below the expected (normal) future spot price in order for the redundancy to be absorbed. This means that the forward price will also rise above the current spot price (indicating a *contango* in the market) *but* it would remain below the future expected spot price by the amount of normal backwardation. So, in this case $S_0 < F_0 < E[S_1]$. The difference $F_0 - S_0$ provides for all costs of storage, depreciation and interest charges. The difference $E[S_1] - F_0$ provides additionally for the insurance premium against price fluctuations. A speculator will buy and hold the redundant stock today at a price S_0 only if he expects to sell it at a higher price in the future. Absorption of redundancy will reduce the pressure on prices and the latter should rise. This would stimulate production but the latter will only be implemented if producers can cover themselves from the risks of price fluctuations. This means that production will commence if producers can sell forward their output to be produced at the end of the period at prices F_0 lower that the expected future spot price $E[S_1]$.

The crucial link that transforms redundant working capital to *liquid* capital able to be absorbed by both consumption and new production is the speculator that assumes the carrying costs and risks at a price. This price is the difference between spot (current and expected) and forward prices that makes it possible for the hedger to roll over risk, get rid of price depressing stocks and commence production and for the speculator to assume risks betting for profits. Hence, *liquidity* is not an automatic outcome by the mere existence of unsold or unused stocks. It demands the formation

[6] See also Hicks (1939), pp. 138

of expectations and the trading of risks through the interrelation of spot and forward prices.

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