SPECULATION, PROFITABILITY, AND STABILITY

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PROPONENTS of flexible exchange rates have maintained that a completely free exchange market is very likely to be stable. In particular they have argued that any profitable speculative activity in this and other markets must necessarily be stabilizing. By this they appear to mean that it must, ceteris paribus, reduce the frequency and amplitude of price fluctuations. In this note, I dispute this allegedly universal proposition with the aid of a counterexample. Certainly this counterexample is not meant to suggest that profitable (or even unprofitable) speculation will never exert a stabilizing influence. How often and to what extent speculation is stabilizing remains a matter for empirical inquiry.

Perhaps a more important aim of this note is to indicate the sort of mathematical apparatus which is necessary for an analysis of the effects of speculation on stability. The techniques are precisely those which have been used in other stability analyses, and it is surprising that they do not seem to have been employed in this area. Because most of the mathematical analysis of speculation and stability has been conducted in static terms, it has failed to get to the heart of the stability question which, of course, refers to properties of the price movements.

Nature of the Arguments

It is easy to recapitulate the basic argument which maintains that profitable speculation is necessarily stabilizing. In Professor Friedman's relatively guarded words, "People who argue that speculation is generally destabilizing seldom realize that this is largely equivalent to saying that speculators lose money, since speculation can be destabilizing in general only if speculators on the average sell when the currency is low in price and buy when it is high." 1

Certainly this position conflicts with what may, depending on the point of view, be described as our commonsense or our preconceived views. There is however a counterargument. 2 This maintains that speculative profits characteristically are earned by selling after the price peak has been passed and by buying after the beginning of the upturn. This is because speculators know they cannot forecast the future with accuracy, and so can only hope to identify price peaks and troughs in retrospect after the price trend has been well established. By doing so they give up any chance to skim off the cream but hope in return significantly to reduce their risks. The occurrence of such speculative patterns is not implausible. Certainly, for example, this aim is inherent in the idea of buying and selling in accord with the Dow Jones indicators and in some of the other investment formulas, though there may be some question about the extent to which these schemes succeed in realizing their goal.

The main point is that speculation of this variety involves purchases during the upswing and sales during the downswing. It will have some stabilizing influence in that, if profitable, it involves higher priced sales than purchases thereby forcing the higher prices down and vice versa. But it must also have a destabilizing influence in accelerating both upward and downward movements because speculative sales occur when prices are falling, and purchases are made when prices have begun to rise. For

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1 I am very much indebted to Professors Chandler, Dorfman, Friedman, and Viner for their comments.

2 Milton Friedman, Essays in Positive Economics (Chicago, 1953), 175. Friedman adds in a footnote: "A warning is perhaps in order that this is a simplified generalization on a complex problem. A full analysis encounters difficulties in separating 'speculative' from other transactions, defining precisely and satisfactorily 'destabilizing speculation' and taking account of the effects of the mere existence of a system of flexible rates as contrasted with the effects of actual speculative transactions under such a system." For another such statement see Friedrich A. Lutz, "The Case for Flexible Exchange Rates," Banca Nazionale Del Lavoro, No. 32 (December 1954), 30-32. The argument goes back much further. For further references see James A. Ross, Jr., Speculation, Stock Prices and Industrial Fluctuations (New York, 1938), 127, footnote 1 and 134, footnote 19.

3 See e.g. Ross, op. cit. 131, 134-38.
this reason the speculative activity may be profitable, yet be on balance destabilizing.\footnote{The main point of this counterexample then is that while the Friedman argument takes account of the levels of the variables it neglects their time derivatives, and the time path is dependent on both. Note the analogy with Samuelson’s criticism of the Hicks stability analysis, *Foundations of Economic Analysis* (Cambridge, 1947), 269–76.}

Several questions must be answered before this argument can be accepted.

1. What precisely is the difference between a speculator and a nonspeculator? Are not those to whom the profit-makers sell and from whom they purchase also in some sense speculators? If so, the preceding argument breaks down, because it is not really true that speculation is on balance profitable in this situation. Rather, it just amounts to some more skillful speculators profiting at the expense of others.

2. The sort of speculative pattern just considered has both a stabilizing influence, in that its sales occur at a higher price than its purchases, and a destabilizing influence, in that it accelerates price movements. Can the destabilizing influence ever predominate?

3. Can the acceleration of downward and upward movements, even if it is the dominating influence, ever increase the amplitude and frequency of fluctuations, or will it simply result in lengthened price plateaus at the old peak and trough levels with a reduction in the time taken in moving from peak to trough?

I shall dodge the first question in the next few sections and only deal with it indirectly in the next to the last section. Certainly there are no absolute definitions available to the positivist to settle the matter once and for all. It may be pointed out that a similar problem exists for the argument which maintains that profitable speculation must be stabilizing. Indeed in a market which trades a fixed stock of items (e.g. securities) among a fixed group of traders it is a tautology that net money profit (meaning net cash withdrawal) of the group is zero. Whatever one group of traders gains another must lose, and it is necessary somehow to define the second group to consist of non-speculators. In most of the present paper this problem will be evaded by assuming that there exists a group of non-speculators on some unspecified definition and that its activities somehow result in cyclical behavior in the price

of some commodity. The effect of the entrance of speculators into the market will then be examined.

It may be remarked, however, that for practical problems the answer to the first question may not be so very difficult. For the relevant dichotomy may not be between pure speculators and pure non-speculators, but rather it may involve conscious vs. unconscious speculators or professional vs. amateur speculators, or even pure speculators vs. those whose market behavior is not primarily influenced by speculative considerations. That professional or pure or conscious speculators can profit at the expense of the hybrid residual groups, and do so in a destabilizing manner is, I think, conclusively shown by the models which follow.

The purpose of the models is to provide a construction which permits measurement of the amplitude and frequency of the price movements and thereby an unambiguous answer to questions 2 and 3.

**Market in the Absence of Speculators**

It is simply assumed here that the pattern of prices of the commodity in question is endogenously determined and that the time path of prices is perfectly cyclical, i.e., sinusoidal and of constant amplitude. This time path can be represented by a second-order difference equation,\footnote{It should be noted that no other second-order linear difference equation with constant coefficients and no lower-order equation of this variety will produce the sort of time path which is described above.}

\[ P_t = 2 a P_{t-1} - P_{t-2} + k, \quad |a| < 1 \quad (1) \]

It is also convenient to assume \( a > 0 \), for reasons which will be seen presently.

The solution of this equation is

\[ P_t = c \cos qt + s \sin qt + R = p \cos(qt + r) + R \quad (2) \]

where \( R \) is a constant which represents the mean level of prices; \( c, s, p \) and \( r \) are constants determined by initial conditions; and \( q \) is an angle given by \( \cos q = a < 1 \).

As already mentioned, I assume that the behavior of non-speculative traders is of such
a variety that this time path will result. However, it is possible to give some sort of meaningful if unconvincing economic interpretation of equation (1). Aside from the inherent desirability of such an interpretation it will be needed to decide how to bring the speculative elements into the model.

Suppose the non-speculative excess demand function (quantity demanded minus quantity supplied as a function of price) is

$$E_t = K - UP_t + V(P_t - P_{t-1}) + W(P_{t-1} - P_{t-2})$$

where $W$ is a positive constant; and $V$, $U$, and $K$ are constants given by

$$V = W(1 - 2a),$$

which is positive for $a < \frac{1}{2}$,

$$U = 2W(1 - a),$$

and

$$K = Wk.$$

Direct substitution of these values into (3) together with the equilibrium condition $E_t = 0$ at once yields our basic equation (1).

Equation (3) states that excess demand is dependent on current price and recent price trends. The dependence on current price is given by $A - UP_t$, where $A$ is some positive constant. This says that an increase in price will result in a linear decrease in excess demand. The dependence on recent price trends is expressed in $K - A + V(P_t - P_{t-1}) + W(P_{t-1} - P_{t-2})$ and states that rising recent price trends make for high excess demands.

Speculative Behavior

It is now necessary to formulate a mathematical description of the speculative behavior postulated in the first section. The idea is that speculators will do the bulk of their buying right after the upturn and their selling right after the downturn. The trough and the subsequent upturn are characterized by a downward movement followed by an upward movement. If the trough is at $t$, $(P_{t+1} - P_t)$ and $(P_t - P_{t-1})$ will then both be positive. Similarly if $P_{t+1}$ is the price of the first period after a downturn, both of these expressions will be negative. At all other times these expressions will be of opposite sign. This suggests that a speculative excess demand function given by

$$E_{st+1} = C[(P_{t+1} - P_t) - (P_t - P_{t-1})]$$

$$= C(P_{t+1} - 2P_t + P_{t-1}).$$

where $C$ is a positive constant, will have the desired properties. I shall prove that this is so. First note that (3) and (4) together with the equilibrium condition $E_t + E_{st} = 0$ give

$$0 = K - WP_t + 2WaP_{t-1} - WP_{t-2}$$

$$+ C(P_t - 2P_{t-1} + P_{t-2})$$

$$= K - (W - C)P_t + (2Wa - 2C)P_{t-1}$$

$$- (W - C)P_{t-2}.$$

From this follows

$$P_t = \frac{K}{W - C} + \frac{Wa - C}{W - C}P_{t-1} - P_{t-2}. \quad (5)$$

If $Wa > C$ (so that certainly $W > C$), i.e., if speculative demand is not too large relative to non-speculative demand, both fractions in (5) will be positive and the second fraction will be less than unity. Thus the equation will be of precisely the same form as (1), and this too will involve a sinusoidal constant amplitude time path for price.

We now derive two properties of our model:

Property 1: Net speculative purchases of the commodity in question are given by a sinusoidal curve of constant amplitude and the duration of each cycle is equal to that of the cycle in prices. Maximum purchases occur one period after the upturn in prices, and maximum sales occur one period after the price downturn.
Property 2: The speculative behavior described by (4) is profitable provided the cycle is more than four periods long.

Proof of property 1: Since the form of (5) is precisely the same as that of (1), expression (2) is the solution of (5) for appropriate values of the constants in (2). That is, the time path of prices is once again given by (2).

To see how this price behavior affects speculative excess demand, substitute expression (2) for $P_t$ into the speculative excess demand function (4). We then have

$$E_{t+1} = C[p \cos(qt + q + r) - 2p \cos(qt + r) + p \cos(qt - q + r)]$$

$$= C[p \cos(qt + r) \cos q + p \sin(qt + r) \sin q - 2p \cos(qt + r) + p \cos(qt + r) \cos q + p \sin(qt + r) \sin q],$$

so that,

$$E_{t+1} = 2pC(\cos q - 1) \cos(qt + r). \quad (6)$$

Here $2pC(\cos q - 1)$ is a negative constant since the cosine of an angle is usually less than unity, and indeed, by elementary difference equation analysis we have from (5) $\cos q = \frac{W_a - C}{W - C} < 1$.

Comparing this result with (2) we see that $E_{t+1} = -D(P_t - R)$, where $D$ is a positive constant. This proves the first property, since it states essentially that speculative excess demands fluctuate inversely with prices one period earlier (note the time subscripts of $E$ and $P$) and are inversely proportionate with the deviations of the past periods’ prices from the mean price level.

Proof of property 2: Speculative profit during period $t$ is the excess supply by speculators (quantity sold minus quantity bought) multiplied by the price, i.e., it is, by (2) and (6)

$$-P_t E_t = [p \cos(qt + r) + R]$$

$$[D \cos(qt - q + r)]$$

where $D = -2pC(\cos q - 1) > 0$ [see (6)].

Thus profit over the cycle is the sum of these single period revenues taken over the entire cycle beginning at period $T$:

$$T_{360}$$

$$\sum_{t=0}^{T-1} [pD \cos(qt + r) \cos(qt - q + r)]$$

$$+ RD \cos(qt - q + r)].$$

I assume here that $\frac{360}{q}$ is an even integer. Consider first the second term in this expression. Write $G = qT + q + r$. Then this second term is the sum

$$RD[\cos G + \cos(G + q) + \cos(G + 2q) \ldots$$

$$+ \cos(G + 180q - q) + \cos(G + 180q) + \cos(G + 2q$$

$$+ 180q + \ldots + \cos(G + 360q - q)].$$

This sum is equal to zero because for any angle $Q, \cos Q = -\cos(180q + Q)$. Turning now to the first term of the expression for profits over the cycle and taking $qt + r = Q$, the sum of any two consecutive terms may be written

$$pD(\cos Q \cos q + \cos Q \cos(q - q)]$$

$$= pD(\cos^2 Q \cos q - \sin Q \sin q \cos Q$$

$$+ \cos^2 Q \cos q + \cos Q \sin Q \sin q]$$

$$= 2pD \cos^2 Q \cos q.$$
complete cycle every time $t_q$ in (2) increases by $360^\circ$. That is, the cycle will be of length $t = 360/q$ and hence of frequency $q/360$. In the absence of speculation write $q = q_N$. Here $0 < \cos q_N = a < 1$. In the presence of speculation write $q = q_s$ so that $0 < \cos q_s = \frac{W_a - C}{W - C} < 1$. Since the fraction $\frac{W_a - C}{W - C}$ is smaller than $a$, $\cos q_s$ is less than $\cos q_N$, i.e., $q_s/360 > q_N/360$. This really just confirms the intuitive notion that speculative purchases during the upswing and sales during the downswing will speed up the cyclical process.

Proof of property 4: This is obvious since, by (2), the amplitude of the fluctuations will be $2\phi$ whose magnitude depends on initial conditions. But a bit more can be said on this matter. Suppose that the speculators first observe the market in question to learn its behavior and then enter that market. The time path in the non-speculative market then provides the initial conditions. I shall now show by two illustrations that even so both increases and decreases in amplitude are possible.

First some preliminaries. From (2) we may write

$$P_t = c \cos qt + s \sin qt + R,$$

and

$$P_t = c' \cos q't + s' \sin q't + R$$

respectively for the non-speculative and speculative time paths, i.e., for the respective solutions of equations (1) and (5). It is to be noted that the constant $R$ is the same in both solutions.\(^3\)

Set $t = 0$ in both cases and assume that the corresponding $P_t$'s are the same (the first initial condition). We obtain $c = c' = (P_o - R)$. If this initial price is at the mean value of the prices, i.e., if $P_o = R$ so that $c = c' = 0$, the time paths simplify to

$$P_s = s \sin qt + R$$

and

$$P_t = s' \sin q't + R$$

whose amplitudes are $2s$ and $2s'$ respectively.

Now for our two cases illustrating the effects of speculation on amplitude:

\(^2\)Proof: set $P_t = P_{t+4} = P_{t+2} = R$ in (1) to obtain $R(2 - 2a) = k$. Now make the same substitution in (5), getting $R((W_C - C) - 2(Wa - C)) = RW(2 - 2a) = K = kW$ by (3). Thus in both cases we have $R = k/2(1 - a)$.

\(^3\)Case 1: Speculation decreases amplitude. Let the second initial condition for the speculative case be given by the $P_t$ of the non-speculative time path. Then since $t = 1$ we have\(^\text{13}\)

$$s \sin q = s' \sin q' = \sqrt{1 - (\frac{W_a - C}{W - C})^2} / \sqrt{1 - a^2} > 1.$$

Case 2: Speculation increases amplitude. Let the second initial condition be given by the peak (or trough) of the non-speculative time path so that $qt = 90$. Then

$$s' \sin q' (90/q) = s \sin q (90/q) = s \sin 90 = s$$

or

$$s' = s' \sin q' 90/q < 1,$$

since $0 < q' / q < 1$. This result has a simple intuitive explanation. The two sine curves which portray the time paths of prices in the speculative and non-speculative situations coincide at the mean price level, at $A$ (Chart 1), and at the peak $E$ of the (non-speculative) curve $AC$ with the longer cycle. But at the

\(^{13}\)The last line employs the relation $\sin B = \sqrt{1 - \cos^2 B}$ for any angle $B$.\)
latter point the other (speculative) curve, $AB$, since its cycle is shorter, must already be on its way down, i.e., its peak must be higher than that of the non-speculative curve.

A similar restatement is possible for case $i$. Here the two curves $AC$ and $AD$ meet two consecutive periods near the midpoint of the cycle, i.e., they are roughly tangent in that vicinity. The speculative curve $AD$ has the shorter cycle so it must reach its peak first and therefore its peak will be at a lower level. Both curves start climbing at the same rate so the one which has the longer time in which to climb will reach the highest level.

A Differential Equation Model

I outline briefly an analogous differential equation model because it permits me to illustrate another more impressive form which may be assumed by speculative destabilization. Again I posit price behavior in the absence of speculation to be perfectly periodic and of constant amplitude. It is then representable by the equation

$$P = R - a\ddot{P}$$

(7)

where $\dot{P}$ is the second derivative of $P$ with respect to time, and $a$ and $R$ are positive constants.

Equation (7) can be taken to be derived from the following not entirely implausible non-speculative excess demand function

$$E = 0 = R - P - a\ddot{P}$$

(8)

This says that the excess demand curve will be low near the trough when the second derivative is positive, and high in the vicinity of the peak. Such perverse behavior seems rather characteristic in some markets!

I now assume speculative excess demand to be given by

$$E_s = U(R - P) + WP, \quad U > 0, \quad W > 0,$$

$$\dot{P} = \frac{dP}{dt}.$$  

(9)

Roughly, this exhibits the features we desire because it has speculators concentrating their purchases when prices are simultaneously low ($P < R$) and rising ($\dot{P} < 0$). That is, they will be buying preponderantly during the beginning of the upswing, and, analogously, selling mainly during the beginning of the downswing. It is also possible to show that this speculative activity can be profitable. By (8) and (9) the equilibrium condition $E + E_s = 0$ is now equivalent to

$$P(\dot{1} + U) = (\dot{1} + U)R + WP - a\ddot{P}$$

or

$$P = R + \frac{W}{\dot{1} + U} \ddot{P} - a\ddot{P}$$

(10)

which can be written

$$R + 2r\ddot{P} - s\ddot{P}.$$  

This will have complex roots $r + \sqrt{r^2 - s} = r + qi$ and hence a cyclical time path provided $r^2 < s$, which will surely hold if $W^2 < a$, that is

This can be shown more rigorously. Differentiation of the solution (11) below, for $P$ yields

$$\dot{P} = AE^{rt}[r \cos (qt + B) - q \sin (qt + B)],$$

Substituting this and expression (11) for $P$ in (9) gives us

$$E_s = AE^{rt}[(Wr - U) \cos (qt + B) - Wq(\sin qt + B)],$$

i.e.,

$$E_s = -KAE^{rt} \cos (qt + B - E),$$

where $K = \sqrt{(Wr - U)^2 + (Wq)^2}$, $\cos E = -(Wr - U)/K$ and $\sin E = Wq/K$. Set $U > rW$ in (9) so that all of these are positive and therefore $0 < E < \pi/2$. Comparing the last expression for $E_s$ with (11) we see that speculative purchases are inversely related to price and lag behind price movements but by less than one quarter of a cycle, as desired.

Proof: Suppose first $W = 0$. By (9) speculative excess demand is now $E_s = U(R - P)$. In other words this is the case where speculative excess supply does not lag behind purchases. Now speculative profit over the cycle is given

$$\int_{t_0}^{t_0 + \frac{2\pi}{q}} -PE_s dt = \int_{t_0}^{t_0 + \frac{2\pi}{q}} P(P - R) dt = \int_{P > R} P(P - R) dt + U \int_{P < R} P(P - R) dt = UP_s \int_{P > R}(P - R) dt + UP_s \int_{P < R}(P - R) dt, \quad P_s > R > P_s$$

(all positive constants) by one of the mean value theorems for integrals. Since we are assuming $W = 0$, by (10) $r = 0$. Then by (11) $P$ is sinusoidal, so the portion of $P$ above $R$ is a mirror image of the portion below $R$. Therefore the last two integrals are equal in absolute value. The first integral is positive and the second negative, so that profit over the cycle is positive.

This proves our result for $W = 0$. But (9) shows that profit over the cycle, as expressed by the first integral in this footnote, is a continuous function of $W$. It follows that for sufficiently small $W$, i.e., if the lag in speculative demand is sufficiently small, the postulated speculation will be profitable.
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is, provided the lag in speculative excess demand behind price movements is sufficiently small.

But there is an important difference between the solution of (10) and that of the non-speculative equation (7). The roots of the characteristic equation of (10) have a positive real part and the solution is

\[ P = A e^{t \cos(qt + B)} + R, \ A \ \text{and} \ B \ \text{constants.} \]  

(11)

These fluctuations are no longer of constant amplitude. Rather their amplitude will grow at a geometric rate. Thus profitable speculation has demonstrated its destabilizing ability by knocking the system from its position of delicate constant amplitude balance into a time path of explosive fluctuation.\(^{16}\)

A Real Non-speculative Cycle

It will be recalled that both our non-speculative cycle models have involved excess demands which are influenced by price trends as well as by prices. This raises some doubts whether the traders in question can legitimately be classed as non-speculators. In a letter to the author, Professor Friedman has suggested that perhaps a non-speculator can only safely be defined (if this is done in terms of his demand curve) as one whose purchases are directly influenced by current prices but not by past prices or price trends. In the absence of speculation, so defined, cyclical price movements can only result from real influences. It may perhaps be conjectured that such a cycle would not be subject to any destabilizing effects of profitable speculation, since the speculative influence on rates of price change would, by definition, not affect non-speculative behavior.

I shall now argue, however, that even in such a situation speculation which is apparently profitable can be destabilizing.

Suppose the supply \( S \) of some commodity varies sinusoidally, say, as the result of seasonal climatic changes, in accord with the equation

\[ S = \frac{1}{D} \]  

(12)

On Friedman's criterion the non-speculative demand function may take the form

\[ D = K - VP, \]  

(13)

where \( K \) and \( V \) are constants and \( D \) and \( P \) respectively represent the quantity demanded and current price.

In the absence of speculation the equilibrium condition is \( D = S \), which readily yields by substitution of

\[ S = D = K - VP \]  

and \( S = -V \ddot{P} \) into (12),

\[ P = \frac{K - A}{V} - B \ddot{P}. \]

(14)

This is of the same form as is (12) and involves constant amplitude sinusoidal price movements, as is to be expected.

What happens when speculation is imposed on this real cycle? The equilibrium condition (zero excess demand) is now

\[ D = S + E_s = 0 \]  

where \( E_s \) represents speculative excess demand, and is given by equation (9) in the preceding section. Substitution of this expression and (13) into (14) yields

\[ S = K - VP + U(R - P) + W \dot{P} \]  

which may be rewritten

\[ S = C - EP + W \dot{P} \]  

(14)

(15)

Substituting this and the corresponding expression for \( \ddot{S} \) into (12) we obtain the third-order differential equation

\[ C - A = EP - W \dot{P} + B E \dddot{P} - B W \dddot{P}. \]

Since complex roots come in pairs, at least one of the three roots of the characteristic equation must be real, and it cannot be negative since the terms are alternately positive and negative.\(^{17}\) It follows that the time path of prices is changed by speculation from a cyclical

\[ X^2 - 3X + 5 = 0, \]  

since the substitution of a negative number for \( X \) will make every term negative, and the sum of four negative terms can clearly never be zero.
pattern of constant amplitude into an unstable, explosive movement.

However, we must see whether this speculation can be profitable. Here the matter is not quite so clear cut. In the short run, the time path may still be approximately cyclical, and the previous arguments apply. In the long run, the root whose real value is largest will determine the time path of $P$. If this is a complex root, again the analysis of the preceding section seems applicable. But if this root, $r$, is real, the time path of $P$ will eventually approach $a e^{rt}$, where $a$ is a constant. The speculator's excess demand as given by (9) of the previous section will then be

$$U(R - ae^{rt}) + Wrae^{rt}.$$ 

This will be positive for appropriate values of $W$ and $U$. In other words, speculators will continue to buy on a rising market and, at least in terms of the value of their assets, this would appear to be profitable. However, it is clear that difficulties can arise if speculators try to cash in these profits or if they run out of funds with which to continue their purchases.

Stability of Unpegged Flexible Exchange Rates

I digress from my central theme to recapitulate a recent discussion by Professor Viner. I have just maintained that even if exchange markets would otherwise be stable, speculation may act as a destabilizer. By contrast Viner has indicated that even if exchange rate speculation were stabilizing, the stability of flexible exchange rates is sometimes questionable. Together these two discussions then call into question much of the stability analysis of the proponents of flexible exchange rates.

Viner argues that the equilibrating forces, which are ordinarily taken to be present in commodity markets cannot be expected to help stabilize unpegged exchange rates. In competitive markets, for example, the relative price of one consumers' good as against another is determined by costs of production and demands. If this price ratio is out of line with costs, capital will find it profitable to flow from the production of one item to the other and move prices back toward their equilibrium ratio in accord with the well known analysis.

But the peculiarity of the exchange market is that the cost of production of the commodities traded is, for all practical purposes, nil. Governments or the central banking systems can, at nearly zero cost, expand their currencies at will, and frequently they do not resist that temptation. Moreover, a currency "... has no price ceiling or price floor derived from any direct utility as a consumers' good or any indirect utility as an ingredient, a technical coefficient, in the production of producers' or consumers' goods." 19

If, for example, one country inflates indefinitely, the exchange rate of its currency against others can fall indefinitely unless the foreigner himself inflates with equal success. By countering balancing inflations, a precarious and rough constancy of exchange rates might be maintained, but in the absence of any pegging mechanism, the coincidence could end at any moment.

This means also that there is little reason to expect any consistent pattern of cyclical price movement on these exchanges. Rather, the time path can plausibly be expected to be erratic, responding to the political developments in the countries involved. This may appear to limit the applicability of the arguments of the earlier part of this paper, because these arguments examined the effects of speculation on perfectly cyclical price movements; but it is possible to interpret any one of the cycles discussed as a never-to-be-repeated erratic individual movement which may well approximate some actual exchange movements. These illustrations, as we have seen, are counterexamples to the assertion that profitable speculation is necessarily stabilizing. If interpreted as single erratic movements rather than strings of regular cycles, these counterexamples may carry rather more conviction for the exchange market case.

The Viner analysis also explains my employment of linear cycle models. It is fairly easy to construct a non-linear "relaxation" cycle model in which a constant amplitude is not the product of bizarre coincidence (see the foot-


19 Viner, op. cit., 291.
note 6 above). Characteristic of such a model is a sudden change in the basic relationships, as in the Hicks model, where attainment of full employment abruptly stops the working of the accelerator. In locating that turning point, the place where the relationships change, one has explicitly or implicitly built up a theory which explains the amplitude of the cycle. This would be very useful for our purposes, for such a theory would permit us to examine the effects of speculation on amplitude directly, and thus to grapple with an essential part of the stabilization question.

But this I have been unable to do because I can see no way of constructing a systematic explanation of turning points of truly flexible exchange rates. If, as I believe, Viner is right, exchange rate movements will be erratic and these turning points will be erratic, or rather, they will be explainable only in terms of the political circumstances of the countries in question.