A MINSKY CRISIS*

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A model is developed to illustrate Hyman Minsky's financial crisis theories. A key assumption is that the level of wealth in the economy is determined macroeconomically, with the value of firms' assets responding to the state of confidence as reflected by discounted quasi rents on capital. The second assumption is that there is high substitutability between liabilities of firms and money in the public's portfolio. A downward shift in anticipated profits leads wealth to contract and the public to shift portfolio preferences toward money. Interest rates rise, leading to further dampening of expected profits, and a debt-deflation crisis can occur.

Hyman Minsky's ideas about financial crises are influential. For example, he provides much of the theoretical foundation for Charles Kindleberger's [1978] well-known book on *Manias, Panics, and Crashes*. But for all his citations in the specialist literature, Minsky's work has never been elaborated formally, and he is scarcely noticed in the textbooks.

One reason for the neglect is that Minsky's theories are both microeconomically detailed and institutional. In recent essays collected in Minsky [1982] he works with at least four types of financial actors: households plus firms variously engaged in "hedge," "speculative," and "Ponzi" finance. Shifts of firms among classes as the economy evolves in historical time underlie much of its cyclical behavior. This detail is rich and illuminating, but beyond the reach of mere algebra.

What can perhaps be formalized are purely macroeconomic aspects of Minsky's theories. Two general assumptions characterize the crises he discusses. The first is that total nominal wealth in the system is macroeconomically determined, dependent on confidence and the state of the cycle. More of his flavor is captured if we further postulate that asset choices by firms and households are not coordinated. Firms build up physical capital, obtaining finance from equity or loans from intermediaries. They can also build up their own net worth. Households use intermediaries or equity to direct their savings toward firms. However, there is no effective arbitrage between valuations of physical capital held by firms and financial capital held by households. The market valuation of shares can deviate substantially from the book value of capital, with the difference being absorbed by net worth. With

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total wealth fluctuating over time, separated portfolio decisions by firms and households can interact to create crises.

The second major assumption is that there is high substitutability among assets in household portfolios under certain circumstances—there can be a flight to money when conditions are ripe. How often this possibility arises is an empirical matter. The crises on record show that it cannot be ruled out of court. When panics occur, interest rates rise, investment is cut back, and profit rates fall. As a consequence, the valuation of firms' capital assets declines, and so does their net worth. The stage is set for the debt-deflation process that Minsky and Irving Fisher [1933] emphasize. Part of the process is extensive financial disintermediation and "disappearance" of assets. Endogenously varying levels of wealth in the macro system permit debt deflation to occur.

The text we follow in developing these two ideas is titled *John Maynard Keynes* by Minsky [1975]. This book has the advantage of stating Minsky's crisis story against the backdrop of *The General Theory* and the distributional accounting of Michal Kalecki [1971]. We largely follow the latter's formulations, beginning with a very simple model, and then indicating extensions at the end of the paper.

On the production side of the economy, there is markup pricing at a constant rate τ over the wage bill (representing prime cost). The nominal wage is w, and the labor-output ratio is b. The price level P is given by

$$P = (1 + \tau)\, wb. \tag{1}$$

Minsky follows Keynes and parallels later model-builders such as Foley and Sidrauski [1971] in assuming that there exist separate capital- and consumer-goods-producing sectors. That complication is dropped here for simplicity, so the price of *new* investment goods is P.

Is it legitimate to impute this price to physical capital goods in place? If so, one can define a rate of profit r as

$$r = \frac{PX - wbX}{PK} = \frac{\tau\, wbX}{(1 + \tau)wbK} = \frac{\tau}{1 + \tau}\frac{X}{K}, \tag{2}$$

where X is the level of output and K is the capital stock. Other pricing rules for physical assets would of course produce different expressions for the rate of profit—in particular, Minsky's analysis is based on prices for individual buildings and machines. Indeed, he would go further and assert that the PK term in the denominator of (2) is impossible to define, after the Cambridge controversies. For that reason, all his formulas are stated as levels, while the ones here are based on division by PK. The trick simplifies differential equations for growth, at the cost of begging serious questions about the valuation of capital stock.

Minsky's investment theory is built around expected returns generated by physical capital in the process of production. In a stylized way, we can imagine firms' using a rule of thumb for investment that depends on anticipated profits and a discount factor. The capitalized value of expected earnings per unit of investment is an appropriate shadow price (called P_k by Minsky) for the investment decision. It can be written as

$$P_k = (r + \rho)P/i, \tag{3}$$

where i is the current interest rate and ρ reflects the difference between the anticipated return to holding capital and the current profit rate r. The variable ρ carries a heavy burden in the story that follows. It represents expected high or low profits, which in turn depend on the overall state of confidence. In Minsky's view, financial and product market conditions, internal finance, and existing liability structures all influence P_k and (in the present treatment) ρ.

Minsky makes investment demand depend on the price differential $P_k - P_i$, where P_i is the supply price of new investment goods (also subject to real and financial perturbations). For present purposes P_i is replaced by P, and the price differential is

$$P_k - P = (r + \rho - i)P/i. \tag{4}$$

Algebra becomes simpler if we use the variant specification (in nominal terms):

$$\text{Investment demand} = PI = [g_0 + h(r + \rho - i)]\, PK, \tag{5}$$

where g_0 is a constant reflecting autonomous capital stock growth, and the coefficient h measures firms' investment response to the expected difference between profit and interest costs. The theory of equation (5) is quite orthodox.[1]

Income streams generated by production are the wage bill wbX and markup income τwbX (or rPK). Following Kalecki, we

1. Using P_k as a shadow price for investment decisions of course resembles Tobin's [1969] use of "q." However, we depart from Tobin by *not* carrying the q-calculation over to the equity market. Separation of the investment decision from the price of equity is a corollary of the independence of households' and firms' financial actions that was mentioned at the outset.

assume that all wages are consumed. Profits are all distributed to rentiers, who have a saving rate s.[2] The aggregate saving flow is given by

$$\text{(6)} \qquad \text{Saving supply} = srPK = s\tau wbX.$$

Excess demand for goods is just the difference between (5) and (6). After dividing through by PK, we get the following condition for equilibrium in the commodity market:

$$\text{(7)} \qquad g_0 + h(r + \rho - i) - sr = 0.$$

If the profit rate r or the output level X goes up when there is excess demand, commodity market adjustment is stable if the condition $s - h > 0$ is satisfied—investment must respond less than saving to profit rate increases.[3] Solving (7) for r and plugging the result into the investment demand function gives a reduced form for the capital stock growth rate g $(= I/K)$ as

$$\text{(8)} \qquad g = \frac{s[g_0 + h(\rho - i)]}{s - h}.$$

A fall in the interest rate or an increase in anticipated profits leads to a higher growth rate. Since

$$\text{(9)} \qquad g = sr$$

from the saving function, the profit rate and capacity utilization go up as well.

The next step is to look at the asset side of the economy, along the usual portfolio balance lines. There is an outside primary asset F, or fiscal debt. It can take the form of money (M) or short-term bonds (B), held by the rentiers (workers' financial market participation is ignored, consistent with the assumption that they do not save). The capitalized value of the plant and equipment held by firms is $P_kK = (r + \rho)PK/i$. Firms have emitted an outstanding stock of equity E; its market price is P_e, determined below. The difference between the value of capital stock and equity is

2. In principle, the saving rate could depend on wealth or some notion of permanent income. As will become clear below, such a behavioral assumption would lead to a positive dependence of s on ρ. The resulting aggregate demand effects would reinforce our story, and are omitted for simplicity,

3. See Taylor [1983] for discussion of stability and other properties of the present model. O'Connell [1983] analyzes a model in which the commodity market stability condition is violated at low levels of capacity utilization, giving rise to unstable dynamic processes with a Fisher-Minsky flavor.

TABLE I

SIMPLIFIED BALANCE SHEETS FOR FIRMS AND RENTIERS

Firms		Rentiers	
$\frac{r+\rho}{i}$	P_eE	P_eE	
		M	W
	N		
		B	

firms' net worth N.[4] Their balance sheet (along with that of the rentiers) appears in Table I. In differential form, the firms' balance sheet identity is

$$P_kI + \dot{P}_kK = P_e\dot{E} + \dot{P}_eE + \dot{N}, \tag{10}$$

where a dot above a variable denotes a time derivative. The liability counterparts of new investment or capital gains on the existing stock are new equity issues, higher equity prices, or increased net worth. We do not go into how firms decide about issuing new stock; hence the adjusting variables are the price of equity and net worth.

Total wealth of the rentiers is

$$W = P_eE + M + B = P_eE + F. \tag{11}$$

A price for bonds does not enter in (11), since they are short term. The change in rentiers' wealth over time is

$$\dot{W} = \dot{P}_eE + P_e\dot{E} + \dot{M} + \dot{B} = \dot{P}_eE + srPK. \tag{12}$$

Their wealth increases from capital gains and financial saving.

At each point in time, rentiers allocate their wealth across assets according to the following equations for market balance:

$$\mu(i,r+\rho)W - M = 0, \tag{13}$$

$$\frac{\varepsilon(i,r+\rho)}{P_e}W - E = 0, \tag{14}$$

and

$$-\beta(i,r+\rho)W + B = 0, \tag{15}$$

4. Large outstanding levels of corporate net worth appear to be characteristic of modern capitalism. See Atkinson [1975, pp. 129–31] for estimates for the United Kingdom and a discussion of the difficulties this phenomenon creates for analysis of wealthholding in general.

where $\mu + \varepsilon + \beta = 1$. Only two of these three equations are independent. As usual, we work with (13) and (14) for the money and equity markets with i and P_e as the equilibrating variables, respectively. The excess supply function (15) for bonds will be equal to zero when the other excess demand relationships satisfy the same condition.

The arguments in the asset demand functions are the bond interest rate i, and the anticipated profit rate on physical capital, $r + \rho$. Incorporating transactions demands would require the use of X/K (or r, again) as an additional argument, but this possibility is ignored for simplicity. The notion behind using $r + \rho$ to measure returns to equity is that wealthholders try to look through Wall Street to "fundamentals" on the production side, instead of basing share purchase decisions on the Dow Jones average P_e. A more elaborate theory of asset demand would use the expression $(r + \rho)P/P_e + \hat{\Pi}_e$ as the return to equity, where $\hat{\Pi}_e$ is the expected growth rate of P_e. If, following the rational expectations school, the actual and expected rates of inflation of equity prices were made equal (except for a white noise error term), then (14) with $(r + \rho)P/P_e + \hat{\Pi}_e$ as the return to equity could generate a stock price bubble. Inverting (14) would make $\hat{\Pi}_e$ a positive function of P_e, and the standard rational expectations saddlepoint solution could emerge.[5]

We ignore this possibility because bubbles do not seem central to Minsky's crisis theory, though he mentions them from time to time.[6] His argument would be that under most (but not all) circumstances shareholders simply do not agree about expected inflation of the equity price. On average (though not for some) the arbitrage opportunity is ignored; the possibility of capitalizing economy-wide capital gains or losses on share prices is not exploited.[7] Folklore has it that Joseph Kennedy got out of the stock

5. In formal terms, let $\phi\,(i,)$ be the inverse function of $\varepsilon(i,)$ with respect to its second argument. Then from (14) with $(r + \rho)P/P_e + \Pi_e$ as the return to equity we have

$$\hat{\Pi}_e = \phi\left[i, \frac{P_eE}{F + P_eE}\right] - \frac{(R + \rho)P}{P_e},$$

so that $\hat{\Pi}_e$ depends positively on P_e. For more on how such a relationship can generate saddlepoint instability, see Burmeister [1980].

6. See also Kindleberger [1978]. The textbook example of a rational expectations bubble is the tulip mania in Holland more than 300 years ago. For an early exposition of the theory, see Samuelson [1957].

7. Analogously, investment demand never responds with enough alacrity to potential profit to drive $r + \rho$ and i into equality. Minsky [1975] cites borrowers' and leaders' risk in the investment context and nowhere suggests that tulip mania triggers macroeconomic capitalist crises.

market before the crash of 1929. Most other participants did not, and their error generated a crisis of confidence of the type to be discussed below.

With bubbles excluded, the key variable in (13) and (14) is the anticipated corporate return $r + \rho$. Note already from Table I that higher returns bid up firms' valuation of their capital stock. The same is true of financial wealth, since from (11) and (14),

$$W = \frac{F}{1 - \varepsilon(i,r + \rho)}. \tag{16}$$

An increase in r or ρ will drive up ε, and thus share prices and financial wealth will rise. In effect, rentiers' net worth is determined macroeconomically from their valuation of anticipated profits, feeding into market balances for asset supplies and demands. The share price can be solved for as

$$P_e = (\varepsilon/(1 - \varepsilon))(F/E); \tag{17}$$

in turn P_e determines the change in firms' net worth given their investment and issuance of new equity in (10).

From (16) it is easy to rewrite the money market excess demand function as

$$\mu(i,r + \rho) = \alpha[1 - \varepsilon(i,r + \rho)], \tag{18}$$

where $\alpha = M/F$ is the share of fiscal debt issued as money.

Using subscripts i and r to stand for partial derivatives with respect to the interest rate i and the expected profit rate $r + \rho$, we may write the differential form of (18) as

$$\eta_i di + \eta_r dr = -\eta_r d\rho + (1 - \varepsilon)d\alpha, \tag{19}$$

where

$$\eta_i = \mu_i + \alpha\varepsilon_i$$

and

$$\eta_r = \mu_r + \alpha\varepsilon_r.$$

A higher bond interest rate cuts back on demand for money, so that μ_i is negative. Since demand for equity also falls, ε_i is negative, making $\eta_i < 0$. The partial derivative μ_r is negative, but an increase in r or ρ raises the demand for nominal equity. From the standard assumption that assets are gross substitutes, $\varepsilon_r > |\mu_r|$. However, if money and equity are close substitutes in asset demand, the magnitudes of the two partial derivatives will be close to each other. If, further, α is a small enough fraction, then $\eta_r < 0$. For reasons to be made clear shortly, we shall assume high substitutability between money and equity, so that the portmanteau derivative η_r is indeed negative.[8]

Note immediately from (19) that an open market operation to increase the money supply would raise α and reduce the interest rate for a given rate of profit. From (3) and (17) there would be higher asset prices P_k and P_e, a result that long passages in Minsky [1975] are used to justify. An increase in the expected extra profit rate ρ will reduce i when there is a high degree of asset substitutability.[9]

Equations (7) for the commodity market and (18) for money form a system analogous to the usual IS/LM construct. However, it should be recognized that underlying (18) is the assumption that both money and equity markets clear. In equilibrium, the price of equity P_e and nominal wealth W are determined along with the profit and interest rates. As shown in Figure I, we assume that the financial market equilibrium schedule has a negative slope in (r,i) space, due to strong substitution between money and liabilities of firms. The "story" is that if realized or prospective profits increase, then rentiers wish to shift their portfolios away from money and bonds and toward claims to real assets. With a sufficiently strong shift away from money, the equilibration process requires a rise in the equity price and hence in wealth. Interest rates fall to make households content to hold the existing stock of bonds at the increased level of wealth.

For short-run stability in our analog to the IS/LM system, the slope of the financial market curve must be shallower (less negative) than the slope of the commodity market schedule, as shown in Figure I. An increase in ρ will pull rentiers sharply enough toward equity to bid down the interest rate, as shown by

8. If we included transactions demands in the model, they would make η_r less negative or positive. We assume substitution effects dominate.

9. Minsky [1975] prefers to treat the negative effect of ρ on i in terms of shifts in liquidity preference. On page 123 we learn that "during a boom the speculative demand for money decreases." Further, on page 76 if higher income from a boom "is interpreted as increasing the surety of income from capital-asset ownership, then the liquidity preference function will shift, so that for a given quantity of money, the higher income, the higher the interest rate, and the higher the price of capital assets." In other words, for given money *and* income, higher expected profits (which drive up the price of capital assets) would have to be associated with a *lower* interest rate (because, again, speculative demand declines). The implied sign change in the derivative η_r from positive to negative as r rises could be modeled in the present framework. Its main effect would be to increase stability on the downswing and make an endless Minsky crisis of the type discussed below impossible.

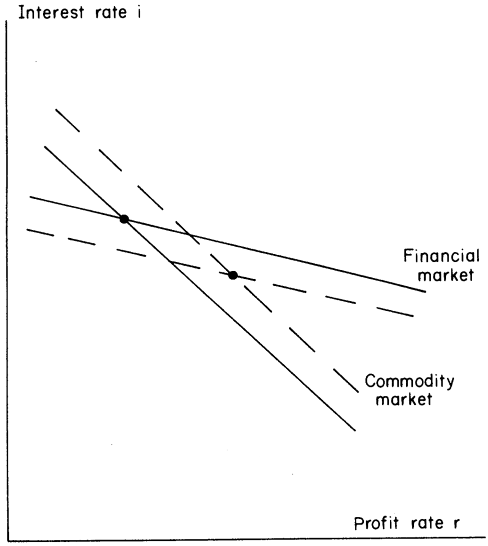

FIGURE I

Responses of the Interest Rate and Profit Rate to an Increase in the Expected Incremental Profit Rate ρ

the dashed line. In the commodity market, a higher ρ stimulates investment demand, thus increasing output and the rate of profit. Overall, the outcome is a lower interest rate, a higher profit rate and a higher P_k—there is a positive linkage between expected profits and the actual profit rate and rate of capital stock growth. On the other hand, if prospects seem grim, a fall in anticipated profits will lead rentiers to flee toward money, drive up interest rates, and strangle growth. Tighter monetary policy (a lower α) would have a similar effect, shifting the financial market locus upward. The outcome would be a higher interest rate and a lower rate of profit.

These mechanisms can generate a crisis. To see the details, we have to specify how anticipated profits and monetary policy evolve over time. The most plausible theory about the expected profit differential ρ is that it should depend on the general state of the economy: ρ might increase, for example, when the actual profit rate is high or the interest rate low. Both hypotheses in fact give the same dynamics, but we use the interest rate link here, since it involves easier algebra. To do so, suppose that the "normal" dynamic story about ρ is given by the equation,

$$(20) \qquad \dot{\rho} = -\beta(i - \bar{i}),$$

When the rate of interest exceeds its "normal" long-run level $\bar{i}$, expected profits begin to fall.

To complete the dynamics, government policy behavior must be specified. In standard Keynesian fashion, both monetary and fiscal policy have substantial influence over the path of capital stock growth in our model. Minsky [1982] offers lengthy discussion of the interaction of monetary and fiscal interventions in a complex financial system. In the current model, the money-debt ratio α can be written as

$$\alpha = \frac{M}{F} = \frac{M}{PK}\frac{PK}{F} = \frac{M}{PK}\left(\frac{1}{f}\right),$$

where f is the ratio of outstanding fiscal debt to the capital stock. Leaving fiscal complications aside, we fix government expenditures as a proportion of the capital stock and taxes as a proportion of expenditures. On these assumptions, f is fixed, and government spending disappears as an autonomous component of the capital stock growth rate g. The money-debt ratio then evolves according to the rule,

$$(21) \qquad \hat{\alpha} = \hat{M} - g,$$

so that for a fixed money growth rate $\hat{M}$, $\hat{\alpha}$ falls as g increases.

The non-activist monetary policy of pre-Keynesian days when financial panics occurred with some frequency could be characterized as a choice of a fixed rate of money supply growth. This sort of policy has a flavor of "leaning against the wind," since money growth does not respond to changes in g. However, it is a far cry from the activist policy pursued in many countries after World War II. The shift of October 1979 in Federal Reserve operating policies toward more precise targeting of money supply growth rates might perhaps be characterized as a move from more complicated interventions toward a rule like (21). Minsky might attribute the retreat from this policy in mid-1982 to growing realization on the part of the monetary authorities that crises can still occur.

The system (20) and (21) has a steady state equilibrium at $i = \bar{i}$ and $g = \hat{M}$. With partial derivatives from (20) in the first row, its Jacobian matrix takes the form:

$$(22) \qquad \begin{bmatrix} -\ \beta i_\rho & -\ \beta i_\alpha \\ -\ (g_i i_\rho + g_\rho) & -\ g_i i_\alpha \end{bmatrix},$$

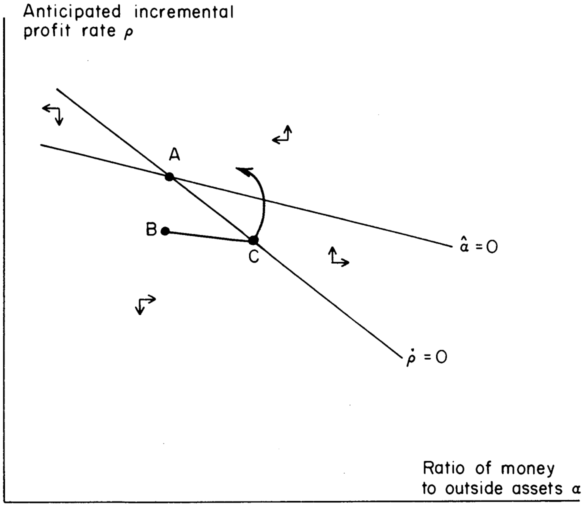

FIGURE II

Adjustment Dynamics When a Fall in the Expected Incremental Profit Rate ρ from an Initial Equilibrium at A Leads Finally to a Return to Steady State

where the subscripts on i stand for derivatives through the IS/LM system, (7) and (18), and the growth rate derivatives come from (8).

Equations (20) and (21) are potentially unstable. From Figure I, an increase in ρ lowers the interest rate and thus raises the derivative $\dot{\rho}$ in (20). This positive feedback does not necessarily dominate the system, since the Jacobian determinant $-\beta i_{\alpha} g_{\rho}$ is easily seen to be positive (signaling possible stability).

The phase diagram appears in Figure II, with arrows showing directions of adjustment in the different quadrants. To explore the possibilities, assume that the economy is initially in a complete steady state equilibrium at point A. A momentary lapse of confidence would cause ρ to jump down from A to a point like B. Equally, a one-shot market operation to reduce the money supply would cause i to rise. For a newly set (lower) value of α, (20) shows that ρ would start to fall from A, setting off a dynamic process like the one beginning to B.

If the authorities hold to a constant money supply growth $\hat{M}$ when the economy is away from steady state, then a below-equilibrium value of ρ is associated with slow capital stock growth and a rising money-debt ratio α from (21). This increase would reduce the interest rate and raise $\dot{\rho}$. If this effect were strong enough, the economy would follow a path like the one leading through C, and return to equilibrium. A minor crisis occurs in the sense that the profit rate and output fall, leading to a lower interest rate, higher investment demand, and ultimate recovery.

But what happens if the (α,ρ) trajectory does not turn the corner at C? At the micro level, the system enters a debt-deflation contraction such as described by Irving Fisher [1933]. Minsky [1982, p. 42] describes past examples, as follows:

> Whenever profits decreased hedge units became speculative and speculative units became Ponzi. Such induced transformations of the financial structure lead to falls in the price of capital assets and therefore to a decline in investment. A recursive process is readily triggered in which a financial market failure leads to a fall in investment which leads to a fall in profits which leads to financial failures, further declines in investment, profits, additional failure, etc.

In terms of Figure II, output and investment can fall forever, or at least until the model changes. This is a true Minsky crisis, and it occurs when the derivative i_ρ is strongly negative and the slope of the $\dot{\rho} = 0$ locus in Figure II is shallow. Going back through the algebra reveals that this condition applies when there is high asset substitution. A reduction in ρ leads the interest rate to rise and the profit rate to fall, driving rentiers into money and bidding up the interest rate further. Expected profits fall still more, and the process never ends. An unstable Minsky crisis looks like movement into a liquidity trap except that the interest rate is steadily rising. From (3) and (17), the descent into the trap is accompanied by plummeting capitalized quasi rents and equity prices—general disintermediation. Financial claims and counterclaims collapse as the microeconomic manifestation of the crisis.

To follow the financial collapse in detail is beyond our scope here. However, three observations are worth making. First, Minsky stresses the importance of intermediaries in accelerating both boom and crisis by creation and destruction of "layered" financial structures. Table II gives an expanded balance sheet that may illustrate what he has in mind. Firms now issue debts D_f along with equity as liabilities. These are held by intermediaries as assets, along with quantities B_i and M_i of outside bonds and (high-powered) money. They also have net worth Q and liabilities (deposits) to the rentiers in amount D_i. As far as the public is concerned, these deposits are equivalent to money. Money supply is a variable endogenous to the entire macro system, as argued by Keynesians such as Kaldor [1982].

TABLE II
AMPLIFIED BALANCE SHEETS FOR FIRMS, FINANCIAL INTERMEDIARIES, AND RENTIERS

Firms	
$\frac{r+\rho}{i} PK$	P_eE
	D_f
	N
Intermediaries	
D_f	D_i
B_i	Q
M_i	
Rentiers	
$(M - M_i) + D_i$	
$(B - B_i)$	W
P_eE	

In the initial phases of an expansion, profit rates rise, and interest rates fall. The partial derivatives of firms' net worth N with respect to these variables are

$$(23) \qquad N_r = \frac{1}{r}\left[\frac{rPK}{i} - \frac{(r\,\varepsilon_r/\varepsilon)}{1-\varepsilon}P_eE\right]$$

and

$$(24) \qquad N_i = \frac{1}{i}\left[-\frac{(r+\rho)\,PK}{i} - \frac{(i\,\varepsilon_i/\varepsilon)}{1-\varepsilon}P_eE\right].$$

Signs are ambiguous here, since P_k and P_e on opposite sides of the firms' balance sheet both fall with i and rise with r. However, one would expect N_r to be positive when the share of rentiers' financial wealth held in equity ε and the share demand elasticity $r\,\varepsilon_r/\varepsilon$ are relatively small. If r and P are related positively through a rising markup or aggregate supply curve, $N_r > 0$ is still more likely. Similar arguments suggest that $N_i < 0$. If these conditions hold, then at the beginning of a boom firms' net worth will begin to rise. They will tend to borrow against this increase, creating assets that intermediaries can then expand across the economy. In the downswing, the process will reverse, and the intermediaries' overall importance will shrink. At the top of the expansion, the ratio of debt of firms to their net worth rises, and they shift gradually (in Minsky's terminology) from "hedge" to "speculative" and even "Ponzi" positions. The stage is set at the micro level for financial collapse; ultimately some wave of failure sets it off. Assets and liabilities of the intermediaries contract, as the value of capitalized expected profits declines. The process carries with it bankruptcies and financial hardship, especially for the "Ponzi" firms that had been happily emitting new liabilities to cover ongoing interest costs.

Second, in his recent writings, Minsky [1982] stresses the importance of government deficits and Federal Reserve interventions in cutting off the possibility of open-ended crises as discussed above. In Kalecki accounting incorporating the government, we have

$$\text{Profits} = \text{Investment} + \text{Government deficit} - \text{Current account deficit.}$$

In crisis, investment falls, but the government deficit goes up. It can act as a source of demand to prevent endless debt deflations. In a like manner, Federal Reserve intervention to increase the growth rate of the money supply could preclude crisis. Both fiscal and monetary stabilizers could be described formally by extending our model to include government and central bank transactions explicitly.

Third, bankruptcies of firms are an intrinsic aspect of the downswing. Reductions in investment demand as firms attempt to sell off capital assets to meet inelastic cash requirements can make the "Commodity market" curve in Figure I flat or upward sloping at low rate of profit. In this situation, monetary contraction can lead to unstable dynamics, even in the absence of high substitutability between money and capital. For details see O'Connell [1983].

In closing, observe that for empirical testing the key mechanism in the crisis theory here is the negative relationship of expected profits and the rate of interest discussed in connection with Figure I. This linkage in turn requires a substantial degree of substitutability between equity and other assets in the aggregate portfolio. Were there less substitutability, the financial market equilibrium locus in Figure I would slope upward (as LM curves usually do) and an increase in ρ would drive up i. The $\dot{\rho} = 0$ locus in Figure II would be answered by an immediate upward movement in that variable.

High substitutability plays a central role in other portfolio-based crisis models.[10] It represents a certain absence of inertia in the financial system, as opposed to a case where more sluggish responses to changes in returns underlie general stability. Over time, asset substitutability may rise if the central bank regularly has intervened as a lender of last resort to cut short potential crises. Taking the past as a guide to the future, participants in financial markets may become accustomed to exposed positions. Their portfolio switches may become more frequent and substitution more acute when the economy is at the top of the cycle, or dire portents are in the air. If, under these circumstances, the central bank shifts to a less interventionist policy line, the stage may be set for disaster. With sensitive asset markets, financial crisis must always be considered as a live macroeconomic possibility.

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10. For example, see Dornbusch and Frenkel [1982].