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GOLD: A FORWARD STRATEGY

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INTERNATIONAL FINANCE SECTION

DEPARTMENT OF ECONOMICS

PRINCETON UNIVERSITY

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GOLD: A FORWARD STRATEGY

It is difficult to imagine many men becoming emotionally excited over the "virtues" of an element, such as sulphur, lead, or nitrogen. Yet, element 79, gold, has aroused the passions of mankind for quite some time, leading many prominent men to now famous exclamations over the virtues and vices of this noble metal. Pliny the Elder (23-79 A.D.) wrote: "Would that gold could have been banished forever from the earth, accused by universal report, as some of the most celebrated writers have expressed themselves, reviled by the reproaches of the best of men, and looked upon as discovered only for the ruin of mankind." Much later, in the heated political debate over bimetallism at the end of the 19th century, William Jennings Bryan injected the oft quoted words: "You shall not crucify mankind upon a cross of gold." More recently, in 1968 and on the opposite side of the coin, the President of France, General Charles de Gaulle, proclaimed: "A monetary system based on the foundation of gold, which is alone in having the character of immutability, impartiality, and universality, should therefore be applied."

If the monetary experts, theoreticians, and politicians who have been intimately associated with the international monetary crisis over the past few years were to express candidly their pent-up feelings on the topic of gold, it is a good bet that many would privately support the nearly 2,000-year-old position of Pliny. The question is whether, at the present juncture, gold is a blessing, a nuisance, a combination of both, or neither. Even more important, is there a forward strategy that could be implemented to provide a sound solution of the current problems associated with gold? This essay represents an attempt at a fresh and independent analysis of this controversial issue. First, we shall examine the market for gold, both the demand for gold and the production and supply of gold. Second, we shall point to some of the unique characteristics of gold in the international monetary system. Finally, we shall suggest certain principles of reform and submit a concrete proposal for consideration.

The Demand, Production, and Supply of Gold

THE DEMAND FOR GOLD

In an analysis of the demand for gold one should distinguish between gold demanded for consumption and gold demanded for stockpiling. Gold bought for stockpiling can later return to the market, gold consumed cannot. The bulk of gold consumed, probably more than 75 per

cent, is for the manufacture of jewelry and for similar applications in art. The remainder of the consumption of gold is nearly equally divided between dentistry and industrial applications such as electronics, physics, and chemistry. Gold which is stockpiled can be divided into private stockpiling and official stockpiling for monetary reserves. Finally, the gold which is privately stockpiled could be subdivided further, according to intentions of the buyers, into short-term speculation, long-term speculation, hoarding for safekeeping, and hoarding for traditional reasons.

Purchases of gold, as well as the production of gold, will be measured here in physical terms—that is, in fine ounces per year—although some prefer to use the monetary value of the demand, which would be the physical quantities multiplied by the applicable price. The breakdown of the demand for gold is summarized as follows:

(1) Consumption of gold
  (a) Jewelry and art (approximately three-fourths of total consumption)
  (b) Dentistry (approximately one-eighth of total consumption)
  (c) Industry (approximately one-eighth of total consumption)
(2) Stockpiling of gold
  (a) Private
    (i) Short-term speculation
    (ii) Long-term speculation
    (iii) Hoarding for safekeeping
    (iv) Hoarding for traditional reasons
  (b) Official for monetary reserves

The price elasticity of the demand for gold for use in jewelry may turn out to be positive. This is an anomaly; most commodities have negative price elasticities of demand. The demand for gold to be privately stockpiled fluctuates widely, partly because of the unusually large supply of gold available relative to consumption levels, which makes gold extremely vulnerable to speculative runs as expectations vacillate. The demand for monetary gold is artificial, in the sense that it depends upon political institutions, that is, the set of rules and practices in use among monetary authorities. Thus, the demand for gold turns out to be unique compared with other commodities and must be examined in greater detail before the role of demand in the market for gold can be properly assessed.

Demand for Gold for Consumption

In order to study the demand for gold that is consumed as a function of its price, each of the three major components must be analyzed sepa-

rately. First, consider the demand for gold currently used for jewelry and art, which accounts for somewhat more than 75 per cent of all gold consumed. That gold (rather than other substitutes such as plastics, other metals, and alloys) is used for artistic purposes, is due more to the prestige of gold than to its intrinsic physical properties. In the first few months of the two-tier system, with higher prices for gold on the private market and the resulting higher prices for gold jewelry, the first indications show that the quantity of gold demanded for jewelry may have gone *up*, reflecting the increased prestige of gold. It is interesting to note that the increased attention focused upon gold in this period seems to have had a stronger effect in increasing the demand for gem stones, and diamonds in particular (speculation and hoarding included), than for gold consumed for jewelry (speculation and hoarding largely excluded). Without this prestige effect, without the free publicity that gold has received, and without expectations of further price increases, the opposite result would have been expected.

It is also interesting to consider the possibility of a major drop in the price of gold, say to $25 per ounce. The prices for gold jewelry would decrease only for the portion involving the gold content—the labor content is usually substantial—but the prestige of gold would suffer heavily so that an appreciable decline in the quantity demanded could be expected. Recent experience suggests that a relatively short time-lag exists for the psychological reaction of buyers of jewelry to respond to sudden changes in the price of gold. This behavior of the demand for gold jewelry can be described by stating that the price elasticity of demand for gold jewelry may be positive—that is, the quantity demanded may increase as the price rises and decrease as it falls—at least for price changes not too far from $35 per ounce.

The responsiveness of the quantity of gold demanded for utilization in dentistry to changes in the price of gold is more difficult to assess. As in the case of jewelry, the gold content in the final price to the consumer is relatively low, with the labor content more significant. Why is gold preferred over other substitutes as a filling material for teeth? If gold is considered to be superior because of its physical properties, such as a more permanent filling or as causing less discoloration to filled teeth, then its price elasticity of demand should be relatively inelastic (that is, slightly negative corresponding to a less than proportionate decrease in the quantity of gold demanded for a small increase in the price of gold). On the other hand, if gold is preferred because gold-filled teeth have a prestige advantage over, say, completely white teeth that are filled with ceramic—a "cheaper" process—then a slight positive elasticity could be expected, the same as in the case for jewelry. Since both of these con-

siderations actually play a role in the preference for gold, the two weak effects could be expected at least partially to cancel each other out, leading to an almost completely inelastic demand (that is, with the price elasticity of the demand for dentistry nearly equal to zero, corresponding to practically no influence whatsoever upon the quantity demanded by small changes in the price of gold).

The other industrial applications of gold, such as for electrical contacts, chemical containers, etc., are normally for highly specialized uses where the cost of the raw material is relatively unimportant and comparable substitutes are not readily available. Therefore, this demand could be expected to be relatively inelastic—that is, with a conventional negative elasticity of a small magnitude.

The demand for gold to be consumed can also be analyzed in terms of income and substitution effects. Generally, as incomes and affluence increase from year to year, the demand for gold jewelry in particular increases (with other factors held constant). This means that the whole demand curve, as a function of price, is moving to the right with higher incomes. The income effects upon the demand for industry and other industrial applications are less marked and are actually determined more strongly by technological changes and innovations than by income effects.

The substitution of gold for competitive materials such as silver—or vice versa—in the manufacture of jewelry should be only weakly dependent upon changes in the prices of the competing materials but strongly dependent upon changes in the price of gold itself. Small changes in the price of silver would not be expected to influence greatly the substitution between gold and silver for the manufacture of jewelry for two reasons. First, the competitive position of gold is determined to a large extent by its decisive lead in prestige over silver and other materials rather than its physical characteristics, and this prestige advantage would not be influenced by small changes in the price of silver. Second, the raw-material component in the final price for silver jewelry is less dominant than for gold in gold jewelry (the labor costs are roughly the same) so that a small change in the price of silver would not change the margin between the price of gold and silver jewelry as much as the same per-cent change in the price of gold would. This hypothesis seems to have been supported by the events of the past year, where silver has seen a major price increase without appearing to have lost a measurable amount of its market to gold.

In the opposite direction, substitution for gold should be more substantial with changes in the price of gold, particularly in the downward direction, because the prestige of gold would be directly involved. In fact, as mentioned above, a drop in the price of gold could lead to a

decrease in the quantity of gold demanded for the manufacture of jewelry. However, if the price of gold were to drop sufficiently, gold would become competitive again in its own right, owing to its physical properties rather than to its artificial prestige, and the quantity of gold demanded would *rise* again.

Demand for Gold for Speculation and Hoarding

The demand and the price elasticity of demand for gold for private stockpiling are difficult to analyze. Even if it may be impossible to distinguish exactly which purchases on the private market are for speculation and which for quasi-permanent hoarding, it is essential to distinguish between the two in any analysis of the demand for gold for private stockpiling.

The massive speculation in gold which we have observed recently has exhibited very unstable characteristics. The source of this instability in the gold market can be discerned when a distinction is drawn between the types of information which speculators and hoarders use as a basis for their decisions. One should differentiate between internal information, which consists of data on the behavior of the gold market itself, and external information about the underlying factors, primarily objective in nature but including also subjective expectations by the parties concerned. The unstable influence of speculation can be traced to the increased reliance of speculators upon internal rather than external information in their decision-making. The resulting instability of the composite market for gold can be traced to the additional factor of the increasing role of speculation (with its destabilizing influence), owing to the larger amounts of fluid international capital available for speculation.

This type of phenomenon can be described as being the result of excessive feedback. It is analogous to the result of placing a microphone too close to its loudspeaker. The microphone picks up not only the external signal but also the background noise and amplified signal from the speaker as well, which is amplified and put out by the speaker again even louder, only to be picked up again and reamplified. When a critical condition is reached where the feedback from the speaker dominates the external signal, the system is unstable; a relatively small external signal will initiate a loud roar, with an intensity which is quite independent of the external signal and which is determined rather by the energy-handling capacity of the system composed of microphone, amplifier, and speaker.

The criteria for judging whether a market is internally stable or unstable as a result of the effects of speculation are twofold. A qualitative criterion is based upon the ratio of speculators' reliance on external infor-

mation to their reliance on feedback or internal information about the market behavior. The nature of this criterion was perceived by Keynes in his distinction between *enterprise* and *speculation*, using the former for "the activity of forecasting the prospective yield of assets over their entire life" (external information), and the latter for "the activity of forecasting the psychology of the market" (internal information). Another, quantitative, criterion is based upon the ratio of the volume of transactions by speculators to the total volume of transactions on the market; this ratio is useful in measuring the ability of the market to absorb a destabilizing influence from speculation without becoming unstable itself.

A market may be thought of as an integrating mechanism that combines, through the interacting decisions of buyers and sellers, the evaluations by participants in the market of all external information together with the evaluations by speculators of the feedback of internal information from the behavior of the market. In this context, such general techniques as the one of "chart reading" are fundamentally dangerous, since they turn emphasis inwards—upon a feedback of information from the market itself. In a very simple version, the strategy of "buying when the price is rising on large volume or falling on small volume, and selling when the price is falling on large volume or rising on small volume" may make sense as a guideline for the individual speculator; however, when a significant fraction of market transactions are based upon similar criteria derived from the feedback of internal information from the market, the result will be an unstable market.

The gold market in London before March 1968 showed signs of instability of this type. Since the price was artificially supported, the volume of transactions played the primary feedback role of influencing bullish versus bearish expectations. After the creation of the two-tier system in March 1968, movements of both price and volume have become important components in the feedback of internal information from the market, as would be the case for most other markets. One symptom of the presence of instability of this type is that once the market is perturbed by external information—such as rumors of South African sales of gold, of potential Russian sales of gold, or of decisions by central bankers—the result is a sustained market movement out of proportion to that which could be justified from an objective accommodation to the external changes of conditions. The market for gold tends to amplify any perturbation originating externally as well as any random internal fluctuation.

In a market of this type, it is difficult to apply the concept of price elasticity of demand. Even going back one step further to the dynamic

concept of the "elasticity of expectations," one finds that this elasticity is also unstable. The problem lies in the fact that the demand for gold from speculation is not particularly dependent upon the price of gold in the market in the static sense, but rather upon the price trend in the dynamic sense. For example, a *higher* price for gold in the private market would not be likely to encourage significant buying or selling by speculators, whereas a *rising* price would be likely to generate expectations of a change in official monetary policy on gold, which would be favorable to a bullish position (whether justified by external factors or not) or at least a continuation of the trend, which would encourage increased buying. One concludes that dynamic models of adaptive processes would be most suited for quantitative as well as qualitative analyses of this problem.

Speculation can serve a useful function when it reduces the risks of future price changes for consumers and producers by smoothing the transitions in a changing market situation. Speculation assumes a disruptive role in a market when it becomes dynamically unstable through excessive feedback. Speculation in gold can be justified to the extent that it is based upon the expectation that the price of gold will have to change as a result of external factors, such as the international monetary situation. However, it cannot be justified to the extent that it has been based upon such expectations for a change in the price of gold as were derived from the internal information resulting from the effects of speculation itself upon the market.

Hoarding of gold is fundamentally different from speculation in gold. Hoarding for *safekeeping* involves the holding of part of one's personal wealth in the form of gold, independently of price expectations other than for at least a reasonably stable price. The motivations are diverse, such as the convenience from the concentration of considerable wealth (which makes it easier to hide and transport secretly), more often with the purpose of avoiding taxation or confiscation than for prevention of loss or theft.

Hoarding of gold, silver, other precious metals, and gems for *traditional reasons* reflects a way of life in the Near, Middle, and Far East. The predominant factor seems to be the lack of readily available alternatives for storing one's wealth, such as local bank accounts, access to foreign bank accounts, and local securities markets. Even as new opportunities for investment do become available, tradition may slow the transition to these new forms. Traditions such as inheritance laws and the right of a woman to own and hold precious metals and gems (separate from her husband's property) often play a major role. Local customs and social prestige often place emphasis upon visible wealth in the

form of ornate to very crude jewelry, with less prestige being associated with less visible forms of wealth such as bank deposits, stocks, and bonds.

It is generally presumed that both types of hoarding are relatively insensitive to either the price of gold (static) or to changes in the price of gold (dynamic) in contrast to speculation, which is very sensitive to actual and expected changes in the price of gold. Hoarding seems to be influenced primarily by factors outside the gold market, so that the rate of hoarding or dishoarding is relatively independent of the price in the gold market.

Hoarding of gold for purposes of safekeeping rests on the fact that a large value in terms of money is contained in a small physical volume and therefore can be more easily hidden or guarded from burglars and confiscators. Still, there must also be an assumption that gold will not drastically depreciate and thus will satisfactorily serve the function as a "store of value." Hence, expectations about the future of gold are tacitly presupposed even on the part of hoarders for the purpose of safekeeping. Expectations for a highly unstable and possibly lower price for gold would significantly reduce this category of gold-hoarding by encouraging the hoarding of substitutes with more attractive prospects. Other metals may qualify, and also gems, which however have the disadvantage of having a less sharply defined market value for quick convertibility. In view of the constant dollar-conversion value of gold since 1934—which means that the conversion value of gold with respect to other commodities has been falling steadily with the inflation of the dollar—hoarding gold would not seem to be a rational course of action for most people in the economically advanced countries of the world today. Even for such aims as tax evasion, there are undoubtedly more profitable and equally liquid ways of holding wealth, such as in numbered bank accounts and foreign securities. The rationality or irrationality of gold-hoarding depends on two diametrically opposed possibilities: that gold will be demonetized and its price will fall and, the opposite, that more gold will be bought by monetary authorities at a drastically increased price. It is difficult to say which of the two developments is more probable in the long run.

The demand for gold to be hoarded for traditional reasons is also changing. This demand may turn out to be more sensitive to the price of gold (static), with a conventional negative price elasticity of demand, than has been generally presumed. For example, with the significant increase in the world price for silver in the past two years, an unexpectedly high rate of dishoarding from countries such as India was stimulated, which moderated the increase in the price of silver. It is likewise conceivable that a significant increase in the price of gold in the private

market could stimulate substantial dishoarding of gold from the Near, Middle, and Far East, since the traditional motivations for hoarding in the region are quite similar for gold and silver.

More important than the price of gold in the private market, social and economic change in this region can be expected to influence the rate of hoarding or dishoarding. With the growing international interest in the development of this underdeveloped region, increased attention has been brought to bear upon the problem of capital formation. One of the standard problems is that whatever savings have been accumulated locally are normally applied either to hoarding of precious metals and gems or to investments abroad rather than to productive investment at home. The wealthier class seems to view American and European investments as being more profitable, more prestigious, and safer than local investments. It has become apparent that considerable amounts of domestic savings must be used for domestic development if a reasonable rate of economic growth is to be achieved.

Two examples can be cited of positive actions which have recently been taken to correct this situation. First, the Lebanese government ordered a six-month study in March 1968 to find ways of revitalizing the stock exchange in Beirut. Two of their relevant goals are to increase the number of local securities listed (from 46 in 1965 to a much larger fraction of the approximately 1,250 registered corporations in Lebanon) and to increase the prestige of local investment possibilities. If this initiative is even partially successful, it should set a precedent for initiating a diversion of local capital from the hoarding of gold for traditional reasons into socially and economically productive outlets. As a second example, the World Bank has just set an interesting precedent with a $42 million bond issue floated in Kuwait in August 1968. This bond issue establishes a precedent for allowing people in developing countries, who are unwilling to invest directly in their local development, to invest in an international body which in turn can reinvest locally, providing by means of financial intermediation an indirect channel of local investment for these people. With measures of this type, one sees a tendency of both local governments and the international community to put pressures upon the traditional hoarders to put their capital to more productive uses. Such measures may be expected to reduce the hoarding of gold in this region, quite independent of the price of gold in the private market for gold.

It is, of course, difficult to separate transactions in gold in the private market by motivation into those due to speculation and those due to hoarding. In particular, it would be most interesting to know, in the period since March 1968 when gold consumption has been met almost exclusively by sales from private stockpiles, whether dishoarding has

played a significant role or whether these sales have been primarily by speculators. In comparing the demand for gold for private stockpiling with the demand for gold for consumption, it must be remembered that the former fluctuates over an appreciably greater range than the latter. Consumption of gold is relatively stable, growing at a steady rate attributable to increasing affluence. In a period of only six months (from October 1967 through March 1968) it has been estimated, approximately 86 million fine ounces ($3 billion, at $35 per ounce) were purchased by speculators and hoarders, and it is estimated that approximately 570 million fine ounces ($20 billion, at $35 per ounce) are privately held. This compares with current industrial consumption of only 17 million fine ounces ($600 million, at $35 per ounce) in 1967.

Demand for Gold for Monetary Use

Transactions in gold between monetary authorities and the other participants in the market for gold are artifically determined according to the particular rules in force at a given time. A few models will be discussed briefly to illustrate how the demand for monetary gold as a function of price can be influenced by official policy and monetary agreements.

Model I: The market from 1961 until March 1968. During this period, the price of gold was supported rigidly at $35 per ounce. It is often said that the demand for monetary gold is infinitely elastic with a fixed price. Actually, the quantity purchased by monetary authorities was exactly equal to the finite amount left over after the private demand had been satisfied from the supply of new gold; occasionally, and particularly between November 1967 and March 1968, the demand by monetary authorities was not effective at all and monetary gold was sold as private demand exceeded the supply of new gold.

This system had the advantage of providing the maximum conceivable stabilization for the price of gold, but it was subject to two major criticisms. First, it was vulnerable to bullish speculation on a price increase. When the amount of international "hot money" that was available for speculation became larger than the amount of the monetary gold that central banks were willing to sell to keep the price of gold from rising, speculators were in a position to break the system in a bull market. In the other direction, as long as the central banks were willing to buy all of the privately held gold at $35 per ounce offered to them, which still seemed to have been the case through March 1968, the system was still stable against a bear run.

The second objection raised was that monetary authorities had no control over the total amount of gold available for international monetary purposes. If gold really played a useful function as a currency

reserve and for international liquidity, then the total amount of new gold available for monetary purposes should be either stable or subject to rational control (as argued by some experts interested in an orderly expansion of international liquidity), but it certainly should not be subject primarily to the whims of speculators as it was. It seems that this model provided the world with a supply of monetary gold that was determined more and more by the expectations of speculators for their personal gain rather than in the interest of the nations linked by international trade.

Model II: The two-tier market from March 1968 to the present. Within the framework of the current two-tier system, central banks are supposed to refrain from any transactions in gold with the private market. Hence, the total amount of monetary gold becomes a constant. The demand for additional monetary gold is therefore zero and the price elasticity of this demand is likewise zero, at least so long as central banks are not tempted to break the agreement not to buy or sell gold in the private market.

Comparing Models I and II, one might say that in Model II the physical quantity of monetary gold is held constant whereas the price of gold is held constant in Model I. By freezing the physical quantity of monetary gold, control over the market price of gold is lost, which means that the "market value" of the monetary gold that is held internationally would fluctuate. This problem is formally overcome by agreeing on a fixed "official price" (or exchange value against United States dollars) for monetary gold. Thus, on the official tier the exchange value of monetary gold as well as its physical quantity is held constant. One major weakness of the current two-tier system is that this official value might not be regarded as "realistic" by the public or central bankers themselves if the price on the free market differed too much from the official price. Another major weakness is that, from the point of view of those who believe that gold does fulfill a useful monetary function, both the physical quantity and dollar value of monetary gold are arbitrarily fixed and would not respond to long-term changes in the requirements for the total amount of monetary gold.

Model III (Hypothetical): One market—no support of the price. A naive reaction to the difficulties of Model I would be to propose a model where central banks would be given freedom to buy and sell in the private market in such a way that the total amount of monetary gold available internationally would be responsive *only* to their reserve and liquidity requirements. By asserting freedom to buy and sell gold according to their preconceived requirements, monetary authorities would lose control over the price of gold and, hence, over the dollar value of their

monetary gold. However, central bankers could hardly be expected to tolerate a situation where the book values of their monetary reserves were readily influenced by the whims of a market and this turns out to be the fatal flaw of this purely hypothetical model.

Still, for the purpose of discussion, one might continue naively to complete the model. One might allow central banks to establish independently the dollar *value* of all monetary gold that they feel should be held to satisfy their individual reserve and (international) liquidity requirements. Then they would be required to enter the private market to fulfill these preestablished requirements. However, the majority of their transactions would be in response to changes in the market value for holdings of monetary gold owing to changes in the price of gold. These transactions would net them a small profit since they would have to sell monetary gold when the price rose and buy additional monetary gold when the price fell according to such a formula.

The implementation of such a model would in effect rigidly stabilize the *value* of holdings of monetary gold, whereas Model I rigidly stabilized the *price* of gold and Model II rigidly stabilized the *physical quantity* of holdings of monetary gold. The three models therefore represent three extreme or theoretical cases although the third model may be quite unrealistic and one would not expect that it could or would ever be implemented.

The total quantity of monetary gold to be held (as a function of price) is represented by a rectangular hyperbola in this model. One interesting property of such hyperbolas is that both the physical quantity and the value of additional purchases required (per unit drop in the price) *increase* as the price falls and, inversely, both the physical quantity and the value of additional sales required (per unit increase in the price) *decrease* as the price rises. The official sales and purchases required by this model would, incidentally, have a strongly stabilizing effect upon the price of gold and would thereby discourage heavy speculation in gold.

Model IV: Two-tier market—flexible stabilization of price. The model to be proposed later in this essay is a compromise between the extreme cases of Models I, II, and III above. Both a private tier and an official tier are maintained as in the current two-tier system, but graduated intervention at flexible upper and lower limits is applied to stabilize the price for gold on the private tier. That is, a relatively wide margin is established around the official price of $35 per ounce within which no intervention would occur. Outside of this interval, intervention would be *allowed*, rather than *required* as in Model I, a profit would be possible as in Model III, and official intervention in the free market would increase gradually as the price deviates further from the official price.

By maintaining the official price for gold on the official tier, the dollar-exchange values of official holdings of monetary gold are stabilized as in Model II. Still, the total value of all monetary gold held internationally can be increased or decreased, according to the desires of individual central bankers, through transactions with the private market as in Model III. Over the range of prices where transactions are allowed between the two tiers, any demand for monetary gold as a function of price—if there should be such a demand—would have a conventional price "responsiveness" and would therefore be stabilizing on the price of gold, actively discouraging speculation, as in Models I and III.

THE PRODUCTION OF GOLD

The production of gold follows a more normal pattern, at least in comparison with other mining products. Despite rising labor costs and a constant market price, the production of gold has increased fairly steadily from 1934 to 1966, with the exception of the first four or five years of the postwar period. In 1967 production both in South Africa and in the United States declined by minute fractions, though for different reasons. A higher price for gold would undoubtedly stimulate a higher rate of production, but with a time-lag owing to the increased investment that would be required in existing and new gold mines.

The situation is characterized by the United States, which has over 400 million ounces of gold in proven ores, of which only 10 million ounces could be profitably mined using present techniques at a market price of $35 per ounce. If the market price of gold were to increase substantially, some ores with a lower gold concentration could also be profitably mined. In this respect, the "production-cost" theories come into play, but of course determining the volume of production rather than the value of gold in the classical tradition. The production costs of gold mines with very rich ores may be very low, such as $20 per ounce or less, while for other mines (indeed, the majority of the nonoperational mines in Nevada) the production costs might range from $40 to $70 per ounce. Obviously, unless governmental subsidization is available, only those ores are worked for which the production costs are lower than the market price. Therefore, an increase in the market price of gold could substantially increase the quantity of ores that could be profitably worked and could also stimulate more intensive investment and prospecting for new deposits. The value of annual gold output in the United States is only some $55 million (at the present price), much less than domestic consumption of gold for jewelry, dentistry, and industry. The excess demand can be satisfied much more cheaply by producing and exporting goods in which the United States has a comparative advantage over other countries, and using the proceeds to pay for imported gold.

It is remarkable that the world's production of gold has increased so much since 1934 despite an unchanged market price, increased labor costs, and the relatively rare occurrence of gold in the earth's crust. The most important factor in the increased production is the discovery of rich new mines in South Africa 30 years ago. The auxiliary factors of mechanization, more rational exploration, and greater capital investment have played subsidiary roles. Although several countries subsidize the production of gold, only Japan and the Soviet Union subsidize production sufficiently to make this the major factor. Production in South Africa, which accounts for nearly 75 per cent of the world's production, fell off by approximately 1 per cent in 1967 but recovered in the first half of 1968, with all indications pointing to a new production record. Production in the United States declined in 1967 primarily as a result of the copper strike, which closed down many facilities that produce gold as a secondary product.

In the absence of any change in the market price of gold, estimates for the rate of production of gold in the future depend primarily upon two factors. First, the discovery of new rich mines is quite unpredictable. Generally, one feels that the most important deposits have already been found in the industrialized countries, particularly Europe. Recent geological reports from the government of South Africa indicate that major new discoveries of gold deposits are nearly certain in the Johannesburg area. They estimate that an investment of only $14 to $28 million for prospecting will be necessary to increase their workable deposits of gold by one third. The Soviet Union has recently made several claims of important discoveries, but these claims have not yet been verified and progress toward the development of the new discoveries for production is unknown. Second, new techniques could make the processing of vast quantities of lower-grade ores economically feasible at a price near $35 per ounce. For example, it has been estimated that one such new technique would make approximately 300 million of the known 400 million ounces of gold in the United States minable at the current price of $35 per ounce. Further, the combined use of new explosive and new leaching techniques should make the mining of very deep deposits of gold equally as practical and inexpensive as surface deposits. Exploration costs for deeper deposits may be higher, but more efficient explorative techniques could also be developed. In this way, the known reserves of gold ore could be quickly doubled or tripled and, at the same time, the fraction of the world's deposits that could be mined profitably at around $35 per ounce would be increased significantly.

The main conclusion that can be drawn here is that if modern technology is brought to bear upon this problem, as now seems to be the

case, then it is not unreasonable to expect a considerable increase in the rate of production of gold at $35 per ounce and a very appreciable increase in the reserves of gold ores that could be mined profitably at that price. The main limitation on this conclusion would be that if the rate of price inflation continues at the current rate, the costs of labor and material for goldmining operations might increase faster than the technological improvements.

In the case of changes in the price of gold and under the important restriction that national policies of taxation, subsidization, and regulation are not changed, the elasticity of production of gold with respect to the price for gold must be considered normal, that is positive as for most commodities. However, particularly in countries where gold is a major export, such as South Africa, one must expect at least some degree of governmental control over the production of an essential export.

The most extreme policy that the government of a gold-producing country might wish to pursue would consist of controlling the production of gold so that the monetary value of gold sales abroad would be exactly that amount needed to maintain balance in the country's foreign payments. In other words, they would want to obtain at least a specified income of foreign exchange through sales of gold and might not want to produce and sell any more gold than necessary to achieve this goal; such a policy would retard the depletion of this natural resource. This means that the authorities would have to limit the rate of production through taxation or equivalent regulatory measures when the price of gold rises to counter the higher profit incentive, and that they would have to stimulate the rate of production through subsidization or equivalent measures when the price falls. The resultant production curve as a function of price would be a rectangular hyperbola, which is in direct analogy to the demand curve in Model III above.

Such a policy could be implemented easily for small changes in the price of gold, say, plus or minus $5 per ounce, but would be very difficult and probably self-defeating for large changes in the price of gold. Also, governmental authorities would be more strongly inclined to intervene with a lower price than with a higher price. Therefore, a compromise between the two extremes of no governmental control versus rigid governmental control would be the most plausible expectation. It should be noted that the recent policy of the Soviet Union for selling gold approximates such a compromise; in recent years all of the newly produced gold has been added to their stocks. Their trade balance, presumably, has not required any proceeds from gold sales but, more importantly, expectations of increased prices of gold have surely weighed against sales at the present price.

One further aspect should be considered: the relative importance of reprocessed scrap. If the demand for gold jewelry does not increase too fast relative to the total amount of gold jewelry, the reprocessing of old jewelry may provide a considerable fraction of the gold used. It has been reported that in the United States nearly 30 per cent of the industrial gold demand was met with reprocessed scrap in 1967. New leaching techniques are also under consideration which may make the simultaneous recovery of gold and silver from the refuse of large cities profitable.

THE SUPPLY OF GOLD

Gold is again unique among all commodities with respect to the vast quantity that is stockpiled. The world's stocks of gold held in the form of bars, coins, or other shapes, either officially by monetary authorities or privately by hoarders and speculators, is estimated at approximately 1.7 billion fine ounces ($60 billion at $35 per ounce). This compares with a current rate of consumption of approximately 17 million ounces ($600 million at $35 per ounce) per year. If all production of new gold and reprocessing of old gold were to cease completely, it would take approximately one hundred years for the current stocks to be consumed at the current rate. With few exceptions, such as silver, no other commodity has been accumulated and stored in such quantities relative to the rate of consumption. (It has been estimated that the amount of silver hoarded in India alone would be sufficient to meet world consumption of silver at current rates for 15 years.)

In view of the advocacy by many monetary experts of a demonetization of gold, this vast stock of gold poses an unusual problem. If demonetization were implemented together with a rapid divestment of gold from monetary stocks (demonetization is possible without immediate divestment, as was the case for silver), the market price for gold would fall to a very low level. Not only would the speculators and hoarders of gold suffer enormous losses, but it would be impossible for the central banks to sell their holdings at a price anywhere near $35 per ounce. This collapse of the market would dwarf the present difficulties of South Africa in trying to dispose of her *current* production on the private market without causing a sharp decline of the price.

The fact that the rate of production of gold has usually been low compared with the total stocks of gold in circulation has frequently been cited as a favorable attribute of gold in its monetary role. It must be pointed out that this factor was favorable only when gold was used as currency and may actually be unfavorable when gold is utilized as a monetary reserve rather than as currency itself. As long as gold and silver, or even fully backed gold and silver certificates, were used as the

primary form of currency, physical limitations on the potential for expanded new production were important to prevent inflation.

The "quantity theory" in the formulation by Irving Fisher is a useful tool for dispelling the apparent paradox as to whether this attribute is favorable or unfavorable. The Fisher equation, quantity of money $\times$ velocity = price level $\times$ physical volume of transactions, must hold as an identity in the static sense, but the question has been actively debated as to what functional relationships can be derived in the dynamic sense. It is a truism that, if the quantity of money in circulation were to change drastically and quickly without simultaneous offsetting changes in the velocity of circulation and the physical volume of transactions, the price level must rise or fall, as the case may be. In this context, relative inflexibility in the quantity of gold makes sense as a positive attribute contributing to stable prices when gold is used as currency or as a determinant of the supply of money. However, in the current situation, where the stocks of gold are held privately and as monetary reserves rather than as currency in circulation, the above argument is no longer applicable. Changes in the quantity of gold held as monetary reserves need not directly influence the price levels, and a limit on the physical quantity of gold available for use as monetary reserves does not serve as a direct restraint upon inflation. The fact that gold is no longer used as currency or as a determinant of the supply of money means that the positive aspect of this attribute has been considerably weakened.

In order to see this point more clearly, consider the very hypothetical situation where steel is used as the primary monetary reserve. Steel has a price determined by an equilibrium of the traditional factors of supply and demand that could not be manipulated as easily as the price of gold can be controlled by monetary authorities. With the high rates of production and consumption for steel, the ratio of stocks of steel held as monetary reserves to production and consumption could not in the foreseeable future even approach the ratio of stocks of gold held as monetary reserves to the production and consumption of gold. Monetary authorities could increase their monetary reserves of steel appreciably at a rapid rate without greatly influencing the price of steel—the excess productive capacity of steel mills makes the elasticity of production very strongly positive. Likewise, monetary authorities could eliminate their monetary reserves of steel in a reasonably short period of time without depressing the price for steel significantly (the demand for steel to be consumed is large enough to absorb these extra stocks quickly). If speculators were to enter the steel market and were to buy steel as a result of their impression that the current monetary reserves of steel were inadequate to cover international obligations, they would have to buy substantially larger

quantities of steel than gold in order to place appreciable pressure on monetary authorities.

Rigid support for the price of steel by monetary authorities, as in Model I, would require such heavy intervention that it would be unfeasible. But such intervention would not really be necessary, since steel has relatively stable prices dependent upon the current state of the art and the equilibrium between production and consumption. In a period of inflation, the price of steel would be expected to increase with the prices of other commodities so that the exchange value of steel (vis-à-vis other commodities) would remain constant. In comparison, one might say that steel would provide a far better medium to long-term "store of value" than gold. However, in the short run, gold with its artificially determined "official price" serves as a more stable "store of value" when it is only used for exchange, when needed, against the currencies of other countries.

Planning a Forward Strategy for Gold

Gold is no longer satisfactory as a monetary reserve. There is wide agreement that gold eventually will have to be replaced with artificial substitutes specifically designed and engineered for this purpose, such as the Special Drawing Rights (SDR's).

Requirements for a positive strategy

Existing gold reserves cannot be quickly sold off without substantial losses to the value of the reserves of countries now holding gold. Once large amounts of monetary gold are offered for sale, the public will realize that gold is not worth $35 per ounce. Indeed, the present reserves of monetary gold could not be sold off quickly for a price anywhere near the official valuation. At the same time, it would be too expensive to write off the loss of $20 to $30 billion that might be expected if all monetary gold stocks were thrown on the market at once. A compromise must be found that includes provisions for a gradual elimination of gold from the international monetary system—for example, by reducing production and allowing industrial consumption gradually to absorb the excess monetary reserves.

In the course of the gradual disposal of the gold reserves, it would be possible to neutralize most of the undesirable effects of gold upon the international monetary system. First, the supply of monetary reserves can be regulated by deliberate creation of other reserve assets, and become independent of any fortuitous gold transactions. The countries represented in the International Monetary Fund could determine in advance the optimal rate of increase of monetary reserves and could create SDR's

(or some equivalent reserve asset) to offset any reductions in monetary gold stocks and any net changes in the holdings of reserve currencies. Second, the price of gold in the private market can be stabilized within reasonable limits around the official price of $35 per ounce by means of a new policy of flexible support. Under a system of flexible support, central banks, joined in a "gold pool," would start to sell monetary gold in the private market at some ceiling such as $40 per ounce or, if consumption were to increase at a rate faster than is now expected, at a higher price. Likewise, the gold-pool members would start buying at some floor such as $30 per ounce, with the possibility of lowering the price further if circumstances make this desirable. The psychological impact of the gold-pool arrangements in effect until March 1968—when central banks were forced into selling or buying at the official price—would not be associated with the flexible system proposed here. Under this system, sales and purchases would be *allowed* rather than *required*. The central banks would intervene in the gold market only to take advantage of an attractive opportunity to sell or an especially "good buy" in view of their monetary *convenience* and the current market situation.

An equitable basis has to be agreed upon for participation in the gold pool. First, all such transactions should be of a purely voluntary nature, rather than mandatory as previously. Second, transactions must be apportioned fairly among the central banks desiring transactions with the private market, such as by quotas based upon their current holdings of gold and other monetary reserves.

At the same time that the price of gold in the private market is flexibly supported by the participating central banks, the official monetary price of $35 per ounce must be rigidly maintained through the device of at least one guarantor playing the role played by the United States in the past. It would be preferable that the responsibilities inherent in the role of guarantor be spread among as many of the major trading nations of the world as possible. Any country making its currency freely convertible with gold to other central banks would have its currency accepted as a reserve currency with all of the advantages and disadvantages that accrue to a reserve currency when it is held in moderate amounts. In order to prevent excessive holdings of the currency of any one country from developing, quotas determined in terms of its total trade and gross national product would be established. This should prevent the overextension of any single currency.

In the first phase of this strategy, the elimination of expectations for a higher official price for gold would probably cause many private holders of gold to sell some of their holdings to central banks, even at a price below the official price of $35 per ounce if necessary. With the

deglamorization of gold, with technological and economic development, and with changing attitudes, a significant fraction of the private stocks of gold may be expected to be offered to central banks within a period of four to eight years. With gold production still exceeding industrial consumption for several years, even at a lower price in the private market, there would be a surplus from current output available for central banks. With sales from private stocks and from current output, central banks could purchase between $10 and $20 billion worth of gold at a price of roughly $30 per ounce over the next four to eight years. This increase of monetary reserves in the form of gold might provide an adequate expansion of international monetary reserves in this period, so that only small amounts of SDR's (or their equivalent) would have to be created. In fact, a moderate and highly desirable reduction in the current reserve holdings of United States dollars and pounds sterling might be facilitated in this period.

In the second phase, the lower price for gold in the private market would discourage production of new gold and stimulate industrial consumption. After some time, the price would rise gradually to the upper limit and central banks could start selling monetary gold for industrial consumption. Within a period of between 40 and 100 years, all of the monetary gold could be disposed of, and at a small profit over the original price. Of course, this profit would be negligible compared with the interest that could have been earned by holding currency reserves. In real terms, it would represent a loss of purchasing power if price inflation continues anywhere near the current rate. For these reasons, there would be no incentive for private speculators or hoarders to hold gold in expectation of this uncertain minimal profit over such a long period. Only central banks could afford such a long-term low-profit operation. In this case, they would have the consolation of having avoided the large loss which they would sustain through a more rapid sell-off of their gold. The relatively long period would provide central bankers with plenty of time to develop suitable artificial replacements for gold in a more stable and rational international monetary system. Gold would for many years retain its traditional monetary role and this role would indeed be strengthened initially, before the "phasing out" begins.

In order to formalize and implement the strategy developed here, the creation of an "International Gold Exchange" (IGE) is proposed. It is recommended that the IGE be created under the auspices of the International Monetary Fund, but it could be created as an independent agency if so desired. The details of this proposal are outlined in the next section. All numbers given are, of course, for purposes of exposition only

and would be subject to negotiation prior to any actual implementation.

This proposal is directed to the problems of gold, that is, removing the destabilizing influence of speculation in gold and the other undesirable features of gold from the international monetary scene. It is not intended as a panacea for *all* problems in international monetary affairs. In fact, it is deliberately intended that gold will retain a disciplinary influence as long as it retains a monetary role. This proposal does not attempt to solve problems such as those due to a balance-of-payments deficit, the resultant loss of reserves, and the resultant loss of confidence in a currency; but it does attempt to solve the tangential problems of gold so that the more important problems can be solved without unnecessary disturbances from the side effects of gold transactions.

Responsible monetary policy in the future will continue to require effective measures to contain domestic price inflation in order to keep a country's currency from becoming overvalued and to prevent deficits in the balance of payments from developing. If major trading nations persist with policies encouraging excessive price inflation, more severe international measures may become necessary, such as periodic or gradual adjustments of the foreign-exchange rates, preferably under the auspices and with the guidance of the International Monetary Fund. Although the execution of such a policy might prove embarrassing to many countries, it would eliminate the need for large disruptive unilateral devaluations and replace them with gradual and less disruptive adjustments.

PROPOSAL FOR THE CREATION OF AN INTERNATIONAL GOLD EXCHANGE

1. Objectives

a. The International Gold Exchange (IGE) would provide a formal working arrangement between cooperating central banks.

b. The IGE would act as exclusive agent for gold transactions among member central banks.

c. The IGE would buy and sell gold in the private gold market as exclusive agent for member central banks under conditions that will reduce speculative pressure upwards or downwards.

d. Flexibility would be returned to the magnitude of international monetary gold reserves by allowing ordered transactions in the private market with gold producers, gold consumers, and private gold holders.

e. The price of gold in the private market would be stabilized within reasonable and flexible limits around the official price for monetary gold.

f. A gradual demonetization of gold would be achieved over a period of several decades with a minimal disruptive effect upon the international monetary system, gold producers, and gold consumers.

2. Membership and organization

a. The IGE would preferably be organized as a subsidiary of the International Monetary Fund, but could be organized as an independent organization.

b. Initially, any central bank possessing a minimum of $100 million of reserves (gold or convertible currencies of other members) would be allowed to join. *All central banks would be encouraged to join and maintain the minimal reserve requirement.*

c. Later, any central bank that possesses a minimum of $100 million of reserves and has abided by the operating rules voluntarily for a period of two years would be admitted.

d. Members would be free to withdraw at any time and would be automatically expelled if they break the operating rules (for example, by making unauthorized gold transactions).

e. Former members could rejoin at any time by returning their gold reserves to their prewithdrawal level and by reimbursing the IGE for any profits made on unauthorized gold transactions during or before their period of nonmembership, but they would have to serve a probationary period of one year before receiving full privileges again.

f. There would be three categories of membership: full, limited, and probationary, defined in 3b, 3c, and 2e, respectively.

g. Voting on any substantive matters of policy would be in proportion to the total reserves held by the individual members on January 1 of the current year (gold and convertible currencies of other members), with the modifying proviso that full members will have a 10 per cent advantage and probationary members will have no vote. *The slight advantage proposed for full members is to compensate them for voluntarily accepting the extra responsibilities of their position. If it is not felt that this advantage would be useful to the full members in fulfilling their responsibilities, it should be dropped to minimize the antagonisms which it might generate.*

3. Internal operations

a. The IGE would act as a clearing agent for all gold transactions among members.

b. Any limited member which has not undergone a devaluation of its currency for two years could become a full member by agreeing to buy or sell gold in exchange for its own currency at the official par value upon demand by any other members, except probationary members, with the requesting members paying transport and handling charges. *Full members would therefore serve as guarantors of the official monetary price of gold. Their currencies become acceptable as reserve currencies for use by all monetary authorities.*

c. Limited members could demand from any full member that it buy gold from them or sell gold to them at the official par value payable in the currency of the full member; upon mutual consent, they could buy from or sell to any member for its currency gold at the official par value, but would not be obligated to partake of any gold transactions. *Limited members would not accept the responsibility for guaranteeing the official monetary price of gold and their currencies are not acceptable as reserve currencies for use by monetary authorities.*

d. Full members could change their status to limited membership at any time and must do so for a period of two years after any devaluation of their currency.

e. Every full member would guarantee to indemnify other members which hold its currency as a monetary reserve for any losses due to a devaluation of its currency; this guarantee would expire six months after the member gives up its full-membership status.

f. No member would be allowed to make any transactions in gold either in the private market or with nonmembers other than through the IGE.

4. External transactions

a. The IGE would act as the exclusive agent of all members in gold transactions in the private market; all such transactions would be at the discretion of the IGE and upon the request of members. *The IGE must serve as the exclusive agent in order to assure orderly transactions which are equitably apportioned among all members.*

b. The IGE would be prepared to sell gold to the private market at the price of $40 per ounce when the market price tends to rise above this level, and to buy gold from the private market at the price of $30 per ounce when the market price tends to fall below this level. *A relatively wide margin between ceiling and floor at which to commence open-market transactions is the essence of the principle of flexible support.*

c. The right to transact with the private market through the IGE would be apportioned among all members desiring to buy or sell gold in proportion to their total reserves (gold and convertible currencies of other members).

d. Members would place standing orders with the IGE for the maximum amounts of gold that they wish to sell or purchase at the ceiling or floor prices of the IGE. *Any sales above the ceiling price or purchases below the floor price which the IGE succeeds in transacting in the private market would be apportioned among the members with standing orders in proportion to their total reserves until the maximum amounts of their orders have been reached.*

e. Once all standing orders have been filled, the external price would be advanced in units of $2.50 from the basic price, for example, the selling price from $40 to $42.50 to $45 and so on, and the buying price from $30 to $27.50 to $25, and so on down. *A mechanism of this type is suggested as an extension of the principle of flexible support, in order to assure equitable apportionment of all transactions. When the price of gold in the private market is $40 per ounce or above, only sales to and no purchases from the private market would be allowed. When the price is $30 per ounce or below, only purchases from and no sales to the private market would be allowed. When the price lies between $30 per ounce and $40 per ounce, neither purchases nor sales in the private market would be allowed.*

f. Limited members which have made net purchases from other members (at the official price of $35 per ounce) over the preceding two years would not be allowed to take part in external sales (at $40 per ounce or higher) unless they compensate the IGE for the net profit; likewise, limited members who have made net sales to other members (at $35 per ounce) over the preceding two years would not be allowed to take part in external purchases (at $30 per ounce or lower) unless they compensate the IGE for the net profit.

The creation of an International Gold Exchange should not be interpreted as a replacement for the current two-tier system but rather as a desirable modification. Although the two-tier system has never been precisely defined officially, the most common interpretation—that central bankers have agreed neither to buy nor to sell gold in the private market—is certainly not a conceivable basis for permanent operations, mainly for two reasons. First, there are natural pressures which will require some flexibility in the now frozen total quantity of monetary gold—upwards if gold retains its monetary role or downwards if this role is further reduced. Second, although a much higher price in the private market can easily be tolerated, some central bankers might find an uncontrolled market price substantially below the official price intolerable. In this light, provisions will have to be made within the two-tier system to allow at least some orderly transactions between the official and private tiers. The IGE would provide a frame as well as a technique for such transactions.

The latent and to some extent infinitely elastic demand for monetary gold at the floor price supported by the IGE would have a stabilizing effect on the private gold market. Within the band around the official price, no transactions would occur between the two tiers. At the ceiling price, the supply of gold from monetary stocks available to the private market would again, for all practical purposes, be infinitely elastic. Such

a system can be expected to provide stability for the price of gold in the private market around $35 per ounce.

This proposal for the creation of an International Gold Exchange has many similarities to proposals by Edward M. Bernstein, Robert Triffin, and Fritz Machlup for the creation of a "Conversion Account" or "Reserve-Settlement Account." The chief technical difference is that outside transactions in gold of the Exchange are for the accounts of *members*, while the agency transactions in the other three plans are for the agency's *own* account, where the members have merely deposit balances with the agency. In the proposal presented here, the members may keep their own gold and may even add to it when the price on the private market falls, whereas Bernstein and Machlup want members to surrender or earmark all of their gold to the agency, and Triffin wants them to surrender a large portion of their gold. In all of these plans, the agency alone deals in the private market while members deal only with one another and with the agency.

If a coordinated plan, acceptable to the majority of central bankers, is not worked out soon, then it can be expected that some central banks will act unilaterally to resume purchases of gold from the private market whenever the price falls to $35 per ounce. Some central banks are even now considering policies of purchasing newly mined gold from South Africa at the price of $35 per ounce, independent of the price in the private market at the time. Such unilateral arrangements would effectively reintroduce a rigid support of a floor price for gold at $35 per ounce in the private market, despite the aversions of some monetary officials of ever wanting to get involved in a rigid support for the price of gold again.

By making provisions for flexible support now, most of the disadvantages of a rigid support could be avoided. Most important under a flexible support scheme is its emphasis on the principle that central banks would be purchasing gold at a price below $35 per ounce primarily because they feel that it is a good buy at that particular price for meeting their reserve needs and not because they are backed into a corner and have to buy it just to prevent the value of their gold reserves from collapsing. The point is that central banks would not be committed to defend the price of gold at any particular level under a system of flexible support, and any gold purchased in this manner would be distributed fairly among all central banks. Purchases of newly mined gold by central banks and eventually sales as well—both, of course, through the IGE—could be turned into a naturally stabilizing influence on the price for gold in the private market, without having the nature of an official support in the old rigid sense.

There are three especially interesting aspects of the ongoing discussions on gold and the attainment of a more stable and efficient international monetary system. First, the views being presented from the academic community are quite at odds with those from the banking community, which leads one to suspect that the cooperation and teamwork required for the solution of this complex problem does not exist. Second, whenever an international crisis occurs, temporary measures are taken "to buy time," yet the time, however dearly bought, is not utilized for designing, let alone taking, effective measures to correct the basic long-term weaknesses and deficiencies that led to the crisis. Third, although powerful new techniques have been developed for handling problems of this type, primarily from the field of operations research, these modern techniques have not yet been applied to this important problem.

The general category of "simulation gaming" techniques, derived from "war gaming," seems to be particularly suited and adaptable to this problem. The many suggestions and proposals that have been put forward could be formulated as models and tested by means of "simulation gaming" to optimize any parameters and evaluate their feasibility, stability, and most likely effects. One major advantage of this approach is that it would tend to bring the theoretical ideas of the academic community together with the practical ideas of the banking community. The abstract theoretical proposals could be put to tests in which international bankers with practical experience make the "decisions" in the simulation. Realism would thereby be forced upon the theoretical proposals. At the same time, practitioners would become familiar with the possibilities; and they might become less skeptical of anything different from the old system when they see that at least some of the theoretical proposals appear workable after all.

Among governmental agencies directly concerned with these problems, it is common to find considerable resistance to innovative research and contingency planning. They evidently fear that any public admission of a need for study of novel arrangements or any reports that they are actually engaged in research and contingency planning would have unsettling results for the gold and foreign-exchange markets! They apparently hope that if the very existence of problems is officially ignored, speculators and the public at large will be convinced that these problems do not exist.

The problems of international monetary stability are perhaps formidable, but they are not insoluble. If only a small fraction of the creative

energy that has been applied successfully to other endeavors, such as space research, were applied to the problem of international monetary reform, there would be no reason to doubt that acceptable solutions could be found.

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