PREDICTING BUBBLES AND BUBBLE-SUBSTITUTES

Earl A. Thompson, UCLA

Jonathan Treussard, Boston University

Charles R. Hickson, Queens University at Belfast

Working Paper Number 836
Department of Economics
University of California, Los Angeles
Los Angeles, CA 90095-1477
July 9, 2004

July 9, 2004

PREDICTING BUBBLES AND BUBBLE-SUBSTITUTES

Earl A. Thompson, UCLA,

Jonathan Treussard, Boston University,

Charles R Hickson, Queens University at Belfast

PREDICTING BUBBLES AND BUBBLE-SUBSTITUTES

While endogenous asset-price bubbles exist under laissez faire, they occur only as random phenomena such as in mixed-strategy-equilibria. Nevertheless, other, governmentally generated, bubbles – uniquely identifiable by their enormity, long-duration, and concomitant supply increases – are predictable. Two alternative causal observations reveal when one of these enormous bubbles is about to be rationally created by a state's rulers. The first cause, government-debt-induced-imminent-revolution, and its underlying model, predict: The revolutions occurring prior to the emergence of stock markets; history's most notorious bubbles; and, subsequently, national-debt-holding central banks and constitutional government. The second predicts bubbles that are part of a sequence of redistribution-based policy-complements.

INTRODUCTION

So far, economists and historians have analyzed stock and commodity market bubbles after the fact. If an asset price has been steadily rising over an extended period of time at a rate substantially exceeding the money rate of interest, contemporary economists traditionally infer the existence of high learning costs, insurance costs, transaction costs, or holding costs. But if the price then plummets in the absence of any popularly recognized exogenous shock – thereby forming a classic "bubble," – the traditional reaction of economists is that investors should have known better than to extrapolate price trends rather than rationally contemplating the fundamentals determining the long-run value of the asset.

We can do better than this. With an appropriate social and economic theory, we can even **predict** both the birth and death of history's most famous price bubbles and explain why these economic anomalies have been unique to the societies in which they have occurred. At the same time, we will be able to explain a large set of related institutions, which we will come to call "bubble-substitutes."

Before attempting to do so, we should delineate the endogenous phenomenon we are studying.

A. Exogenous-Bubbles and Mini-Bubbles.

Say a series of trader-observed exogenous shocks made the price and fundamental value of an asset steadily rise, and this were followed by a very large – again trader-observed – negative exogenous shock that undid the prior appreciation. Few economists would call this highly unlikely and unpredictable price pattern a "bubble." Economists' bubbles require asset prices to temporarily exceed fundamental

values. Nevertheless, many non-economists, probably reflecting their failure to see or appreciate the underlying shocks, call these exogenous-shock-generated price patterns "bubbles." Bowing toward common usage, we call such price movements *exogenous-bubbles*. For such "bubbles," professional traders – individuals whose superior information determines the fundamental values used throughout this paper – correctly and competitively interpret the underlying shocks.[1] If there were not at least one such well-informed individual, we would have no defensible definition of the "fundamental value" of an asset.

This paper will focus on *endogenous bubbles*, which arise from the dynamic solution actions of individuals in a *given* social technology, a technology remaining unchanged during the bubble period. However, we also follow countless casual observers who do not call endogenous price run-ups and collapses "true" bubbles if they are relatively small. We label such endogenous bubbles "mini-bubbles."

Although all of the endogenous bubbles (or just "bubbles") in this paper are *ex ante* utility maximizing to the involved individuals, the underlying informational asymmetries imply a violation of Pareto optimality (Thompson 1965; Tirole). Nevertheless, a large class of bubbles is second-best optimal: Under certain, historically relevant, conditions, the best medicine for a society's maladies is a bubble.

B. Outline of the Paper.

We consider throughout a subsequently justified economy with a unique competitive equilibrium

---

[1]Although exogenous-bubbles are not genuine economic bubbles and imply no underlying inefficiency, to justify a claim that a price movement is basically exogenous, economists must identify the underlying exogenous shocks. An example of an exogenous-bubble is the U.S. stock-market boom and bust that preceded our last Great Depression. We know this because we can easily identify the causative exogenous shocks: The shock precipitating the '28-'29 stock boom was Europe's resumption of convertibility of their various currencies into gold that occurred in the '25-'28 period. The only way for the nations of European to acquire the gold necessary to make the conversion payments at their inflated post-1914 price levels was to induce the U.S., which held most of the world's gold after WWI, to run a cheap-money inflation, thereby inducing a large trade deficit and outflow of gold to Europe in the late '20's. The U.S. was accommodating Europe in this regard through the wisdom and experience of Benjamin Strong, then the Chairman of the Board of Governors of the U.S. Federal Reserve Bank. U.S. profits, of course, increased as wages lagged behind prices and a large stock boom was a therefore inevitable. When Strong died in the Spring of 1929, monetary policy was put in the hands of comparative amateurs (an exogenous shock), who unfortunately deemed it a good idea to fight the boom by decreasing bank lending, thereby leaving the nations of Europe with no alternative but to deflate their price levels. Since the U.S. government still held a lion's share of the world's gold and European monies were now convertible into gold at their pre-WWI conversion rates, these deflations had to continue on to price levels that approximated their pre-WWI levels. To do this, prices had to fall by over 30%, which meant, again because of the wage lag, an even greater decrease in profits and stock prices (Thompson, 1995). Again, the reason this stock price pattern was not a genuine bubble is that the major movements are explainable by exogenous shocks whose significance was appreciated by many competing market professionals.

at a given distribution of wealth and a rational learning (Baysesian Nash) dynamic environment.[2] Section I shows that endogenous bubbles are effectively impossible in the absence of informational monopoly. Section II then shows that, although endogenous laissez faire bubbles exist under private informational monopoly, these bubbles are: Short-lived; accompanied by no expansion in asset supply; and non-predictable. After classifying these laissez faire price movements as mini-bubbles, and similarly classifying market corners, short-squeezes, and political business cycles, we turn to the endogenous bubbles made famous by journalists and historians. Besides requiring governmental involvement, these bubbles, although coming in two alternative forms, are: Long-lived; accompanied by substantial supply increases; and predictable. Based on a simple model of revolution, Section III develops an anatomy of these predictable bubbles. Section IV shows that history's famous bubbles all possess this anatomy.

I. WHY BUBBLES WON'T ARISE WITHOUT INFORMATIONAL MONOPOLIES

A. Competitive Price Adjustment.

First, consider a symmetric-information learning process, one with no informational monopolies.

*1. **Rational Tatonnement**.* Say that the day's new buy-orders for a particular asset arrive much faster than sell orders at what was the provisional, initial price. Individually rational Walras-style price adjustment (*tatonnement*) calls for an immediate *and discrete*, substantial, price increase. This price jump occurs because discrete evidence has appeared for the existence of an excess demand for that asset. For several potential buyers and sellers immediately observe the substantial excess of new buy-orders over new sell-orders at the initial price, an excess implying that such a low price is not sustainable.

---

[2]Much of the literature on bubbles concerns infinite-horizon multiple equilibria (*e.g.*, Azariadis; Cass and Shell) that are not true equilibria because they imply positive profits to setting-up private pension funds (Thompson, 1967). As these profits are eliminated, lim $t \to \infty$ of the present values of time-t incomes are driven to zero (transversality). Santos and Woodford show that, under this condition, symmetric-information equilibrium bubbles are impossible; bubble-like price patterns are merely fluctuations in fundamental values (our "exogenous bubbles"). We will generalize this result to symmetric-information disequilibria with rational learning.

Existing **asymmetric**-information bubble models, based on rational expectations equilibria, artificially restrict short-sales to create their bubbles (e.g., Harrison and Kreps; Allen, Morris, and Postlewaite; Abreu and Brunnermeier; Scheinkman and Xiong). In fact, short sales have been a common practice since the early 17th century (Chancellor). Our asymmetric-information models – based on a weaker notion of rational learning instead of rational expectations – do not restrict short-sales but require what we call "informational monopolies" to generate bubbles.

Although standard price-adjustment models (*e.g.,* Samuelson; Arrow-Hurwicz) assume a gradual, or continuous, price increase throughout the day as a result of such excess-demand signals, such a pattern is irrational under symmetric information. *Rational* speculators respond to an excess-demand signal, like our order-imbalance, by estimating the expected equilibrium price resulting from the evidence and *discretely* adjusting their supply and demand prices to a new rational estimate. Prices jump, not climb.

Combining the initial price and corresponding excess-demand with this new estimate, the second observed price and corresponding excess-demand observation create sufficient data for the traders to interpolate (or extrapolate) the price that would clear the market. As explained in Appendix I, although other prices are simultaneously adjusting, our bubble-induced interest in a single, potentially very unstable, market justifies an assumption that these other markets equilibrate conditional upon the given, possibly-far-from-equilibrium, price in the market of concern. If the resulting, *mutatis mutandis* rather than *ceteris paribus,* excess-demand function were indeed linear, then the traders' interpolated price would clear the market. Otherwise, the day's third realized price and excess-demand would provide the basis for a new, quadratic, estimate of the excess-demand function and correspondingly more refined estimate of the market-clearing price. This would continue on until the increasingly accurate estimates of the excess-demand function soon created prices that are extremely close to market-clearing (Appendix I).

2. Rational Non-Tatonnement Price-Adjustment. Alternatively, assume that there are no excess-demand observations until many, like a day's worth of, trades have occurred. As above, the immediately preceding excess-demand evidence forces the rational transaction price to jump to the price that this excess-demand evidence suggests will clear the market. So this second observed price is, as was the initial price, an unbiased estimate of the market-clearing price, giving prices the character of a martingale, where actual prices are always equal to objectively expected prices. No price trend is implied. So no endogenous bubbles occur. Also, because more information is being used to estimate the second price, it is expected to be closer to the market-clearing price than the first one. Although slower than the Walrasian dynamic – and more statistical because the significant trading at false prices creates

unpredictable allocative and redistributive effects – the accumulating information still generates a convergent sequence whose currently expected prices always equal market-clearing prices (Appendix II).

3. Characterizing the competitive price paths. Neither the *tatonnement* nor the *non-tatonnement* pricing process described above is prone to costly disequilibrium speculation. For neither generates a predictable price trend. Although prices erratically jump or dive from one informative trade to the next, they do so at a decreasing expected amplitudes in that expected prices better and better approximate an equilibrium as the accumulation of market information ever-better informs the participants about which prices are too high and too low. In short, "efficient market" prices form a convergent martingale.

B. Brief, Unexpected Informational Advantages.

A more challenging generalization admits brief, unexpected, informational asymmetries. Some individuals unexpectedly obtain information relevant to the price of an asset for a short period of time, say a day, before others receive it. They then rationally speculate, *i.e.*, trade with the purpose of reversing their position when their private information becomes public. The resulting price pattern is **not** the efficient-markets pattern emerging from a symmetric-information model. If the speculator submitted a large order accurately reflecting her excess demand at the original price, the market price would immediately jump to her expected value, but she would then fail to profit from acquiring her knowledge.[3] To avoid this, for her, unfortunate price pattern, the freshly informed speculator merely takes existing sell orders off the market at the initial price and only slightly increases the subsequently observed prices of the commodity. She will continue to buy, but the increased prices caused by her concentrated purchases prevent her from ordering anything like her excess demand at the pre-existing prices. Prices

---

[3]This would be socially efficient because the prospective profit she otherwise sees comes as a resource-costly redistribution from less informed investors rather than as a reward for the social value of the information, which is virtually zero for highly temporary information advantages (Thompson, 1965). A law preventing orders that did not reflect one's true demand -- a law much different than observed, largely ineffective, laws discouraging manipulation and enforcing disclosure on large traders -- would induce her to reveal her information. No market failure would arise. (Although a small government subsidy to producing price-relevant information would be a requisite complement in achieving a full Pareto optimum when the informed trader held her information advantage for a significant length of time, disclosure of her trades would not required until her number of trades becomes sufficiently large.) Nevertheless, this paper is concerned with actual markets, not optimal financial regulation.

will rapidly increase as her information is read by other traders because the price changes accompanying her rationally gradual or sporadic purchases or sales would soon indicate to other traders that a large trader is buying or selling the good (Back-Baruch). Despite the confusion created by random orders throughout the day, the price and volume increases would virtually inform the other traders of her expected price. Prices soon plateau at the revised expected value. So, with the exception of intra-day price trends and socially costly speculation, brief, unexpected, informational asymmetries are insignificant: As in A.2 above (and Appendix II), they just slightly delay the achievement of equilibrium.

This uniform convergence to a plateau also holds whether or not ordinary "liquidity" traders are aware of their informational disadvantages. Owners aware of their informational disadvantages would retain their positions following bullish observations. The others would lose by selling to more informed traders, including induced momentum traders, whose profitable rules here generate trend-accelerating speculation rather than bubbles. Were it not for these unfortunately unaware sellers, there would be very little profit to the trader with the brief information advantage and no profit at all to momentum traders, *i.e.*, there would be no significant waste of information-transaction costs on the path to the plateau.

II. UNPREDICTABLE ENDOGENOUS BUBBLES

A. Market Manipulation and Bubbles in the Presence of Informational Monopoly.

Suppose now that the above informed speculator had **long anticipated** acquiring some kind of information advantage. We assume throughout that such long-duration informed traders, whom we label " informational monopolists," are well-financed; otherwise they would not have bothered to put themselves in such a position. Although the above absence of bubbles and correspondingly rapid price increases to promptly reflect the informed trader's valuation are good for society, these benign price patterns will be prevented by the rational, market-preparing, informational monopolist. That is, since the speculator now has time to "prepare" the market, she will be able to buy without signaling her excess demand and substantially fill this excess demand without significantly changing her transaction prices.

Thus, from the start, to optimally exploit her subsequently quite specific information advantage,

an informational monopolist manipulates the market by randomly creating both positive and negative bubbles. She does this in order to prevent traders from changing their expected prices when she later, unpredictably, buys or sells to establish her final speculative position. This requires that she create brief bubbles in order to eliminate the expectation that rapid price changes and volume increases signal further such price changes in the future. Thus, at random points prior to accumulating (or selling-short) the asset, the informational monopolist rationally enters buy or sell orders in the same way as if she had received good or bad news concerning the company, thereby changing the price, but then quickly reversing her order flow. As in Hart, Jarrow, Allen-Gale, and Aggarwal-Wu, such cycle-creating transactions are profitable to zero-cost outsider-manipulators if some traders are momentum-trading or slow-learners, in which case some of the reversal trades of the manipulator would be with ill-fated momentum players or slow-learning liquidity traders. Although fast-learning traders or manipulation costs generally deter these outsiders, an informational monopolist is willing to incur substantial direct losses from manipulation in order to prevent her planned, final, speculative transactions from influencing future price expectations.[4]

Since ordinary traders are correctly aware of the chance that any given price increase may reflect an accumulation pattern by an informed investor, rationally designed price reversals must **exceed** the prior price increases in order to reduce the rationally learned future price expectation to the original level. Longer, larger, manipulated price appreciations, although somewhat less frequent, are similarly followed by still larger price reversals. Once she has so prepared the market, an informational monopolist still expects to buy successive units at successively higher prices, but each price is only insignificantly higher than the previous one because the expected rate of deflation rises as prices rise. Although other

---

[4]This manipulation ideally stops when the informational monopolist has created what Hicks called a "zero elasticity of expectations," where future price expectations are insensitive to current price changes. Momentum traders, who have elasticities of expectation that exceed unity, are eliminated early in her manipulations. Still ignoring transaction costs, it might appear advantageous for the manipulating monopolist to continue her price reversals until she induces negative elasticities of expectation (where a price change is expected to be more than fully reversed). However, such price patterns, which would reveal the presence of a true insider rather than an outsider-manipulator, are not sustainable because they would invite outsiders to, say, accumulate large positions in the asset at progressively lower prices and then wait, either for the informational monopolist to force prices back to their initial levels or for the end of the informational monopoly, when the expected price is equal to the initial price.

investors increasingly infer the presence of an informational monopolist from the abnormally high volatility created by the preparatory manipulations, they also increasingly regard above-normal prices as selling opportunities. For she prepares the market in the same way whether she anticipates good or bad news. Sharp increases in price volatility and volume followed by decreasing price volatility relative to volume indicate that an informational monopolist is preparing the market and prices are about to either jump or dive. For assets persistently traded by informational monopolists, the above pattern forms a long-run, rational-expectations, equilibrium as in the model of Kyle and Vila. Normal (mixed strategy) volume is then very high relative to price changes, the latter occurring significantly only on public news releases.

The dominant models of trading under rational expectations in the occasional presence of a single informed trader, those of Kyle and Glosten-Milgrom, implicitly assume away manipulation. In the former model, admitting such strategies would generate much higher profits to the insider and obviate the reliance on random liquidity trades in order to confuse the outsiders. In the latter, rational bid-ask spreads would vanish because sellers would no longer rationally expect buy-orders to signal higher future prices.

The manipulating informational monopolist facilitates the above strategy with reversals that concentrate in the moments immediately following anticipated, publicly observed, shocks (say scheduled earnings announcements) about which she has no monopolistic information advantage. During these very brief periods, price determination is left to competing specialists who, while possessing no informational monopolies, know enough about fundamentals that other traders rationally refuse to trade until these traders have established a value for the asset (Glosten-Milgrom). In the hour following a public announcement, these relatively informed speculators use their special information to evaluate the change in asset value resulting from the shock. An active manipulator's large trades at such times cannot generally be distinguished from those of an ordinary specialist who simply believes that the asset's fundamental value is affected differently by the shock than the other specialists. However, to the extent that the prices following a public announcement are surprising to the ordinary specialist, there is a high probability that a manipulator has been in the market and is rationally reversing her position.

Consequently, our manipulator, like the information-hiding insider in Foster-Viswanathan, is best-off moderating her concentrated trades during these rounds. In our model, the moderation works to prevent ordinary specialists from confidently inferring the manipulator's reversal pattern.

Professional traders must make money on their shock-induced transactions when manipulators are not in the market in order to compensate them for their losses when such traders *are* in the market. Such increased profit margins are theoretically necessary in order to compensate professional dealers for their expected capital losses from their trades with these more informed traders. Thus, bid-ask spreads substantially increase during shock periods. (See, e.g., Melvin and Tan regarding foreign exchange markets and Madhavan, Richardson, and Roomans regarding stock markets).

B. Bubbles Stemming from Informational Oligopoly.

Now consider asset markets possessing a few, risk-averse or financially constrained, informed traders ("informational oligopoly"). Since the above profit to manipulation is eliminated by free-riding rivals, momentum-trading may now be profitable. For such assets, typically the stocks of companies with many employees or contractors (indeed, Aggarwal and Wu show that manipulation concentrates on the small-firm level), uninformed traders might now wisely take strong positive momentum as evidence that a few, independent, informed traders have all received a positive signal. Although the latter traders compete for the stock and therefore limit the profitability of riding their coattails, liquidity and risk limit their exposure, thereby creating a possible profit to momentum-trading as in Section IB. In any case, prices and volume increase and the stock will rapidly climb, but not jump, to its new equilibrium.

While momentum trading has indeed produced a moderately positive expected measured profit, the entry of competing momentum traders and corresponding decrease in the threshold required for investors to decide that informed traders are accumulating the asset, inevitably creates costly trading errors (Copeland-Friedman). Thus, on occasion, accidental momentum increases caused by coincidental increases in the buy-orders of **non-informed** traders will induce further price-rises as the rationally low-threshold induces a wave of unfortunate, formula-driven, price increases and an inevitable crash. A vivid

example of such a bubble can be found in Avery and Zemsky. Bubble-induced losses thus offset the natural profit arising from momentum trading to create a long-run, rational expectations, equilibrium.

More generally, **any** statistically justifiable, oligopoly-induced, trading rule used in equilibrium eliminates the expected profits of the marginal trader by creating less and less discriminating signals until the rule-determined trading profit is offset by losses from misleading signals and corresponding bubbles.

C. Interpretation and Application.

First of all, it would be foolhardy for an outsider to *predict* the endogenous bubbles arising in the above environments. This is because bubble-creation in the environments is random. At some, externally unpredictable, time, a manipulating informational monopolist will fail to liquidate her accumulation. Or some usually reliable trading rule will begin to inflate prices but then the market collapses because of the fallibility of the signal. Trying to predict a bubble here is like trying to predict a first-pitch curve-ball.

Secondly, both manipulation (small-company) and false-signal (large-company) bubbles imply the positive intra-day as well as day-to-day autocorrelations found in numerous stock-market studies (e.g., Cheung and Ng; Chan, Chan, and Karolyi). Similarly revealing studies show that prices in spot asset markets are much more autocorrelated than the corresponding prices among the better-informed traders in the corresponding futures markets (Chan; Ahn, Boudoukh, Richardson, and Whitelaw).

Finally, in the terminology of Allen and Gale, we have been discussing only "trade-based" manipulation, for which we have seen that predictable bubbles cannot be generated. However, manipulation and bubbles can also be created by the exaggerated claims of people in a position of authority. Such "hype" can significantly influence asset prices even when the companies are large and the purchases or sales of individual traders do not significantly influence their stock prices. All of our predictable bubbles will contain a significant element of hype. In the related, false-advertising, model of Benabou and Laroque, the informational monopolist must mix true with false announcements in order to attract investors. So the private manipulation in Benabou and Laroque is similarly unpredictable.

D. The Duration of the Above, Private-Manipulation and Imperfect-Signal Induced, Bubbles.

An identifying feature of the above bubbles is their short duration. It is virtually impossible for any such bubble to last for more than a few weeks. The cumulative market purchases required to sustain a predominantly increasing price path over an *extended* period of time, which means substantially more than a few weeks, would be so enormous that the manipulator would doubtless be stuck with huge inventories after the burst of the extended bubble. Similarly, the accumulated absence of evidence of additional buying by new, subsequently informed, traders is an increasingly sure sign of a false signal.

While such inventory-accumulation or unverified-indicator problems would not affect the false-advertising variable, or "hype," variable in the paper of Benabou and Laroque, an analogous problem creates a similarly short duration of false-advertising-induced bubbles. There is not only a substantial cost of each hype-story that a speculator may purchase from the media or stock analysts in order to support her speculative position. But the stories rapidly depreciate. For each story is diluted by other information that also accumulates between the positive stories, information that cannot be expected to put the same positive spin on the asset. And the hype-stories often induce subsequent counter-stories. Thus, as above, the effective duration of a series of hype-stories is reasonably limited to a few weeks.

The predictable bubbles arising in this paper will be distinguished by their extended duration, usually measured in months, and associated significant supply increases. Although manipulation is required, something else is also involved. To keep the difference in mind, the private-manipulation-created, essentially random, intra-month, bubbles discussed in this section are classified as mini-bubbles." The remainder of the paper will concentrate on a longer-term market dynamic by assuming that the prices discussed above are market-clearing at the end of each month for given long-term expectations.

III. THE ANATOMY OF A PREDICTABLE BUBBLE

What makes economists able to predict events that most others cannot is that economists have theories enabling them to predict the effects of certain shocks better than those untrained in the black art. For example, if a shock occurs that appears to a lion's share of the investment community to be favorable to industry but is actually unfavorable, the price of publically traded shares of companies in those

industries will rise and fall in something resembling a bubble pattern. Good economists, having witnessed the initial price increases, can confidently predict the existence of an eventual downturn.[5]

However, we are attempting here to predict an *entire* bubble, not just a downturn after prices have mistakenly risen. To do this requires us to predict the bubble-generating shock, the legislation generating the entire experience. Hence, we must include a theory of public choice enabling us to predict the relevant, investor-deceiving, legislative acts. Since bubble-creating legislation typically employs public policies that appear to economists and historians as if they were exogenous, these bubbles have been usually described as exogenous by traditionally accepted authorities (e.g. Garber). However, by endogenizing legislative actions, we shall see that these bubbles are actually quite predictable.

A. Rationally Deceptive Legislation.

Since it almost always takes at least several months for legislative acts to occur, we can expect the duration of the corresponding bubbles to go way beyond that of the unpredictable mini-bubbles discussed above. A small-magnitude, macroeconomic example of a deceptive-legislation-created bubble is a "political business cycle." Such a cycle arises when an incumbent U.S. President or U.K. Prime Minister induces his loyal monetary authorities to expand the money supply in order to take advantage of worker mis-perceptions of the price level to garner more votes in an upcoming election despite the inevitable boom-and-bust cycle that follows the implicitly deceptive shock.[6]

Although we would have no problem in regarding the incumbent re-election-year U.S. stock market booms in 1948, 1964, 1972, and analogous U.K. stock market booms of '55 and '64, along with the immediately subsequent market declines, as "bubbles," and highly predictable ones at that, we

---

[5]Of course, this *ex-post* bubble pattern, like the *ex ante* bubble patterns we are about to discuss, would be insignificant if many, competing, adequately informed, economists were included among the market participants.

[6]Of course, Information differences are implied by these, like other, business cycles. Here, if the public fully understood and thus anticipated the actions of the political leaders, wages would rise with prices and no real effects would follow. The real effects, of course, are that profits increase, which are easily observed by firms even before they show up on accounting statements, and that perceived wages rise, which is implied by the increase in employment during the temporary boom. So labor owners also feel benefitted by the boom.

eschew such revisionist terminology in favor of searching out the distinguishing features of the historical price movements that have heretofore been popularly called "bubbles." One thing that distinguishes the former, political-business-cycle, price movements is their self-corrective nature. As soon as the post-gold-standard public caught on to this Post WWII pattern, which would imply pre-election hyperinflation without a policy reform, the nature of the monetary authorities changed. The new authorities became strongly principled, even if only by banker-serving principles, rather than normal political appointees. The central bank leaders from the mid-70's onward were not going to cave into political pressure to expand the money supply a few months before an up-coming election in order to affect the election's outcome. In any case, the political business cycles were not large enough to induce post-cycle hearings, and therefore not large enough for journalists and historians to label them "bubbles." So we include observed political business cycles with the above-discussed "mini-bubbles" and go on with our search, keeping in mind that we are now searching for legislation that creates very large percentage asset-price fluctuations and post-cycle fraud hearings.

Bubble-creating policies arise only under unusual conditions. To generate these conditions, we assume that a recent exogenous shock has changed the optimum of an informed and rational ruling elite. Bubbles arise in response to such shocks as part of the ruling elite's achievement of its new optimum.

B. When Bubble Creation is a Rational Government Policy.

1. Two Types of Governmental Deception. Bubble-creating governmental actions occur through either: (1) a sequence of positive governmental announcements widely considered to be true because of the rarity with which they are deceptive; or (2) legal "reforms" reducing the legal penalties of deceptive private announcements, "reforms" the public only understands through bitter experience.

The pressure of contrary news is much lower in these deceptive-legislation cases because, again, the announcements of governmental leaders and company executives are more credible than the advertising of investment journalists and brokers. So much larger and longer bubbles than the above-discussed false-advertising bubbles occur when the bubbles stem from rationally deceptive legislation.

Corresponding to each type of legislative deception, there is a distinct disequilibrating shock.

2. Imminent-Revolution Shocks. **(a) A Theory of Revolution.** "Revolution" here occurs when an alternative domestic ruling elite physically overcomes the original defense commitment of the military leaders loyal to the existing ruling elite. We assume throughout that the alternative ruling elite is a rational subgroup of the population in the sense that the group is internally efficient, or "cooperative." The existing ruling elite is also assumed to be rational for our basic theoretical model and central empirical applications, although its rationality consists largely in having made rational prior commitments to finance and defend the state and suffering the consequences if events do not enable it to survive history's slings and arrows.[7]

We also assume throughout our entire discussion that the **entire society** – at an initial formative stage – cooperates to achieve socially efficient rules (Thompson-Faith). That is, the society's military founders constrain the behavior of their future generations in a way that maximizes their utility for the expected utilities of their descendants, $W(U_1(R_1), U_2(R_2)),...)$, where U_t and R_t respectively, t = 1, 2...., represent the expected present values of their time-t descendant's respective utilities and consumable resources and $W_t' > 0$, $U_t' > 0$. These constraints concern internal rent-seeking, including revolutionary activities between a rational ruling elite and rational alternative ruling elite, as detailed below.

Ordinarily, revolution is considered to be an extremely negative-sum game, a costly transfer that would be better achieved by a voluntary transfer rather than costly violence. That is, when the government is worth more to an alternative ruling elite than to the existing ruling elite, a simple purchase of the entire government would appear to be preferable to war. And when the government is worth more

---

[7]Although we cannot satisfactorily examine the history of revolution unless we admit that the ruling elite may fall victim to an objectivity-robbing ideology and thereby make grossly inefficient social decisions (Thompson-Hickson, Ch.1), we will be able to delay our discussion of inefficient ruling elites until the tail end of our historical discussion (Section IV.A). Hence, our model does not apply to the foreign-supported, highly confiscatory, ideology-based, institution-altering, "social revolutions" of the 20th century. These revolutions were rational responses to externally imposed trade liberalizations largely unique to the economic-ideological warfare of the 20th century (Thompson-Hickson, Ch. V). In contrast, the pre-20th century revolutions to which our theory does apply were largely domestic, non-confiscatory, and ideology-free, and reformed few if any domestic institutions. The exception of the notably "social" French Revolution will be discussed in Section IV.A.5.

to the existing ruling elite than to the (single) alternative ruling elite but revolution is still profitable, then the existing ruling elite should buy peace from the threatening rebels. This latter purchase, through conciliatory policies toward the potential rebels, is a common occurrence. But the former, the purchase of an entire government by an alternative ruling elite living in the same geographical area, is a historical rarity. Revolutions occur instead. Before proceeding, we must explain this anomaly.

The resource value of the government to an existing ruling elite, R_t described above, is the value of the resources it can tax away from the others in the state, $V_t(D)$, minus the national debt, D_t, which we assume is owed to others in the state. Since the alternative ruling elites, who are alternative heirs to the founders and therefore plausibly utility-equivalent for equivalent resources, would also receive a value of $V_t(D) - D_t$ under a legal transfer of the government between the two alternative informed and rational ruling elites, legal transfers generate no objective surplus.[8]

Nevertheless, the government may still be worth much more to rational rebels than to a rational ruling elite. Although this excess value would again ordinarily be the basis for a sale of the government to the alternative ruling elite, it is conceivable that the **only way** for the alternative ruling elite to realize its excess value is to militarily conquer the existing ruling elite in a decidedly "unfriendly" takeover.

In particular, debt repudiation may be much less costly to rebels than existing ruling elites. It is easy for successful rebels, who do not accept the legitimacy of the prior regime, to repudiate the national debt. In their eyes, and many future lenders' as well, the debt belongs to their profligate predecessors, not to the rebels. So rebel repudiation – in contrast to ruling-elite repudiation – does not reduce borrowing power. Hence, when a huge national debt threatens the ability of an existing state to defend itself against foreign aggressors, the resource value of the debt-encumbered state to the existing ruling elite, $V_t(D) - D_t$, is much less than it is to the rebels, $V(0)$, the value of a state unencumbered by the pre-existing debt. Of course, $V_t(0) > V_t(D)$ because security against foreign aggression is enhanced by an absence of debt.

---

[8]While irrational operation may make the government less valuable to the existing ruling elite than to the alternative one, the ideology responsible for the value differential would make it nearly impossible for the existing ruling elite to admit this reality. A social revolution would occur instead, as discussed in Section IV.A.5 below.

The function of such a revolution to the optimal-rule-setting initial founders of the state is thus to eliminate the claims of the pre-existing governmental creditors in a way that restores the country's original borrowing power and thus its security against foreign attack. In fact, almost all pre-20th century revolutions left private property rights, other than claims against the government, in tact, although they did entail the resource-costly elimination of the military defenders of the pre-existing ruling elite and related replacement of the political establishment loyal to the interests of state's pre-existing creditors.

Although the existing ruling elite could also repudiate the debt, or retire it at a depressed price, if effective repudiation were easy, the original debt would have carried a prohibitively high interest rate. What makes debt credible in the first place are high costs of repudiation. Hence, W- and U_t-maximization both require debt-repudiating revolutions to be socially costly. We take these costs to be exogenous.

The resource value of a time-t revolution to the social founders is $V_t(0) - V_t(D_t) - C_{et} - C_{rt}$, where C_{et} and C_{rt} are the respective, historically determined, military costs of revolution to the existing ruling elite and the rebels. A time-t revolution should occur when and only when this expression is positive. However, without additional restraints, there is an overly high profit to revolution. First. rebels incur only part of the social costs of revolution. The military costs that rebels impose on defending ruling elites are not internalized by the rebels.[9] Second, regarding revenues, while the rebels internalize the full value of the state to themselves, they do not fully internalize the loss in value to the existing ruling elites. Full internalization of that loss would only happen if the existing ruling elite had offered the rebels' their

[9]The defenders of the existing ruling elite fight despite certain defeat because they are psychologically committed to do so (Thompson-Faith). A conceptually resource-costless revolution occurs when rebels simply buy-out the pained consciences of the disloyal military leaders of the existing ruling elite. With sufficient national debt, the rebels are willing to bid more for the psychologically costly support of the existing military than the existing rulers. Such nevertheless costly "revolutions" would rationalize the certainty model described in the text. More realistically, the military supporters of the existing ruling elite must be militarily defeated in an uncertain contest with the military supporters of the alternative ruling elites, the likelihood of success being appropriately determined by the relative financial contributions of the supporters. The uncertain war can be rationalized by recognizing the natural uncertainty regarding the military productivity of the alternative leadership. That is, a society is generally better off if it waits to change its existing government until it has tested the military productivity of the alternative by pitting it against the old military in what the founding fathers of the entire society would jointly view as an efficient war. A more realistic model of this sort has been used elsewhere to explain the American Revolution (Thompson-Hickson, pp. 168n, 177n, and 217), a revolution that does not fit within our existing framework because it was a war of secession rather than a war for control over a central government.

entire gross value of the state, $V_t(D_t)$, from the state to prevent a revolution. But this does not occur because such "protection" payments encourage unobservable investments in activities that prepare a group of potential rebels for obtaining unjustified transfers. The rational ruling elite therefore commits itself to pay only incomplete protection payments, incomplete bribes to threatening rebels. Thus, letting P be the value of these protection payments, and noting that these payments may include up to the entire value of the national debt because the creditors are willing to pay to prevent the revolution, $P_t < V_t(D_t)$. The private profit to revolution, $V_t(0) - C_{rt} - P_t$, thus exceeds the social resource value of revolution by $C_{et} + [V_t(D_t) - P_t]$. Consequently, unrestrained potential rebels see a private return to revolution that substantially exceeds the social return of revolution. Hence, despite the silver lining offered by our revolutions in terms of improved borrowing power and defensiblity of the state, there is a socially excessive private return to revolution.[10]

There is thus a positive social value of contemporary revolution-deterring strategies. That is, founder-efficient societies feature extra-military methods of retarding revolution. This amounts to efficient time-t revolution-deterrence. We shall see that time-t bubbles and bubble-substitutes work to

---

[10]In a model with realistic uncertainty with respect to the outcome of a revolutionary war, one might think that sufficiently punishing unsuccessful rebellion would suffice to efficiently deter revolution.

However, a relatively harsh monetary treatment of the losers of a revolutionary war, while decreasing the expected return to revolution, equally decreases the expected costs of revolution to the ruling elites because of the correspondingly lower expected monetary costs of revolution to the existing ruling elite. Such fines therefore have no systematic effect on the frequency of revolution. However, once a revolution has begun, a harsher monetary treatment of losers of a revolutionary war increases the returns to winning the war and therefore increases its intensity. The result is a prior legal commitment to a lenient post-war financial treatment of the losers of revolutionary wars. Although a harsher **military** treatment of the losers of a revolution always discourages revolution, such treatment also increases the intensity-of-effort once a revolution has begun. Hence, we cannot unambiguously evaluate the net benefit to the existing ruling class from adopting the C_{rt}-affecting policy of applying harsh physical treatment to the losers of revolutions against its government. (Continued.)

To deal more generally with such ambiguities, we take a step back to see how the defense institutions that determine the costs of revolution were determined in the first place. Our underlying social theory tells us that the founders, or subsequent interactions between ruling elites and the potential rebels, determined these costs in prior, efficient, sequences of communications. Anticipating that revolutions should sometimes occur in the future, C_{rt} was set at a non-prohibitive level. Anticipating also the subsequently excessive private return to revolution, the induced **total costs** of revolution were determined so as to create an efficient frequency of revolution. More specifically, in view of the excessive current (time-t) return to revolution, the founders (or deals between subsequent ruling elites and potential rebels) rationally induced future ruling elites to adopt current, non-military, revolution-deterring strategies that optimally complement their historically-determined military strategies.

reduce the profitability of revolution. Thus, the prior maximization of $W(\cdot)$ implies, and so we **predict**, the existence of contemporaneous revolution-preventatives such as bubbles and bubble-substitutes.[11]

(b) The Basic Anatomy of an Imminent-Revolution Bubble. Once, under the first kind of bubble-generating shock, a segment of the country's population suddenly threatens revolution, the existing ruling elite must respond. Since the prime motive of the revolution is to default on the national debt, a counter-revolutionary strategy is to induce the rebels to increase their rationally zero holdings of the country's national debt. (We assume that the existing rulers are smart enough to have laws against selling their bonds short.) To do this, the ruling elite can create a series of positive shocks in a company that ends up holding a large fraction of the national debt as a by-product of exploiting its primary assets. As we have seen, such hype and hype-induced price-and-volume increases induce both news-sensitive and rationally momentum-playing outsiders, including rebels, to invest in the company and, quite incidently to the investors, in significant amounts of governmental debt. Each government announcement is positively beneficial in drawing more of these investors to own national debt. Although these trend-following investors are not long-term investors, the boom induces the temporarily debt-holding rebels to rationally delay their revolution. Then – whether or not the ruling elite initially realized that it was inevitable – once a significant number of potential rebels have invested in the companies, the investors in the informed ruling elite will sell their inflated stock back to the company in exchange for company debt as well as cash. The positive announcements will then rationally stop. After the inevitable crash, the government, the bankrupt company's main creditor, will own almost all of its own debt and have also redistributed away from the rebels in order to cut-off their imminent revolution at the purse strings.

If the governmental source of the redistribution were clearly understood by the threatening rebels – as it would, for example, if the policy amounted to an announced tax hike – an immediate and self-

---

[11]The above discussion applies when there is only one potential revolutionary group, whom we take to be the members of the society who are neither ruling elites, their creditors, nor the military committed to defending these interests. When there are many potential revolutionary groups, a different theory social applies, one that would take us way beyond the European cultures examined in this paper (Thompson-Hickson, Ch.5, esp. Part I.B).

defeating revolution would ensue. So the redistribution **must be** deceptive, on an *ex post* as well as an *ex ante* basis. The would-be rebels who suffer substantial speculative losses will subsequently blame – rather than the government (who "sympathetically" retires their post-crash stock at above-market prices) – a few scapegoat-promoters and themselves for their own ignorance and greed.

This deception occurs despite what should be a heightened awareness by the rebels that the ruling elite has an incentive to create such a bubble. To allay these rational suspicions, the ruling elite should – and does – pretend to be unconcerned or unaware of the activities of the rebels. It should also initiate the bubble so as to ostensibly benefit mainly ruling-class investors. A simple way of achieving this end is to promote an investment of particular interest to the ruling class and allow investors to trade their government bonds for stock in the promoted company. The latter both creates the appearance of benefitting the ruling class, who are initially the main owners of the national debt, and furnishes the basis for a large incidental accumulation of national debt in the company, whose distressed future condition will enable the government, in its role as the major creditor of the company, to effectively acquire its debt at bargain-basement prices and simultaneously appear to be a savior of the almost-ruined investors.

A revolution-threatened ruling elite is much better-off when it **directly** announces a series of bubble-creating decisions than under the form of deception in which it "reforms" the legal system in order to induce private promoters to produce the hype. For, under the threat of imminent revolution, the ruling elite desires to: (a) *immediately* implement their policy; (b) induce a boom in the stock of firms that hold large amounts of government debt, and (c) attract a very specific set of victims. Hype-creating private promoters cannot be counted on to : (a) *immediately* exploit promotion-inducing legal "reforms"; (b) promote companies holding large amounts of government debt; or (c) target potential rebels.

To summarize the above, basic, anatomy: An imminent-revolution bubble promptly arises in response to revolutionary indications or uprisings that the government only publicly regards as harmless. What follows is a series of government announcements of a great new investment opportunity in a firm whose major assets will incidently include national debt. The announcements, each of which noticeably

improves the publicly expected profit prospects of an investment ostensibly designed to benefit members of the ruling class (and ultimately does, but only because they sell-out early), leaves the essentially bankrupt, government-debt-holding, company in the hands of governmental creditors and several erstwhile rebels with nobody obvious to blame other than themselves and a few embattled promoters.

(c) A Basic Bubble-Substitute: Political Repression. When potential rebels are more financially knowledgeable than legislators, or when the economy is not financially sophisticated in that it lacks both publicly traded shares and bubble-substitute banking institutions described below, the above theory predicts alternative institutions. Rather than suffering a revolution, the rational ruling class will imprison or exile individuals who display politically rebellious behavior. Such harsh political repression will indeed, in Section IV below, be seen to have arisen in potentially revolutionary states of this type.

(d) An Objection to Bubbles and Political Repression as Revolution Deterrents. The above theory predicts revolution-deterring policies based on indicators of imminent revolution. Although such indicators appear in all of the cases we have studied, it is costly for the ruling elites to observe them. To cover situations in which these costs are very high, more robust revolution-deterrents should be sought, institutions eliminating the profit to revolution even when the rulers are unaware of rebel intentions.

(e) Advanced Anatomy. Suppose that the government sets up a central bank whose chief asset is government debt. In this case, a default by a new government would ruin the bank, the bank accounts of the rebels, and the ability of the post-revolutionary leaders to generate efficient financial flows. A bubble-substitute thus arises in the form of a government-debt-holding central bank. Such a financial institution works to substantially lower, generally to negative levels, the profit to revolution. A national-debt-holding national bank is a "poison pill" to potential rebels. In addition to the loss of their own bank accounts and the existing government's opportunity to use the central bank to finance defense emergencies, "successful" rebels would be greeted with financial chaos as the member banks suddenly lose their clearing house.

Correspondingly, accompanying each one of our imminent-revolution bubbles, we will also find

governmental attempts to quickly establish government-debt-holding central banks. Moreover, imminent-revolution bubbles disappear once a nation has set up a national-debt-holding central bank. And old-style, non-ideological, revolutions themselves virtually disappear once such banks appear! But this cannot be the end of the sequence. Once governmental legislators and administrators are free of revolutionary pressures, constitutional constraints assuring peaceful political competition must be employed in order to substitute for the check on their political power previously provided by revolution. Constitutional governments thus arose as militarily imposed complements to government-debt-holding central banks.

(f) A Military Bubble-Substitute. A final bubble-substitute is simply a military grant, in securely constitutional states, of unconditional central government control over the military. Governments that are sufficiently militarily strong relative to civilians are not threatened by domestic revolution. The emergence of governmentally monopolized military aircraft early in this century created a much larger superiority of domestic governmental over civilian militaries than had existed in the past. Revolution in securely constitutional 20th century states would have become rare even in the absence of central banks.

Post-WWI central banks in securely constitutional states thus gradually replaced the long-term government debt in their portfolios with short-term government debt (Ferguson, Simmons). This financial convenience gave potential revolutionaries the ability to default on the nation's long-term debt and still count on a liquid central bank. The modern absence of revolution despite the subsequently unprecedented levels of national debt and taxation of the wealthy can only be explained by the success of modern constitutional government and subsequent centralizations of military control.

(g) Stages of Development of Revolution-Deterring Institutions. Applying the above model to Western nation states, the historical progression has been for: Oppressive government to be the first; imminent-revolution bubbles to be the second; national-debt-holding central banks and constitutional governments to be the third; and constitutional-government-controlled militaries to be the final revolution-deterrent. Section IV.A elaborates on this pattern and, in the process, explains numerous structural details.

*3. **A Suddenly Diminished Concern for the Middle Class.*** Alternatively, say there is a shock in

the desired distribution in favor of an established ruling class relative to ordinary people. This occurs, for example, when a new, less sympathetic but militarily stronger, ruling family inherits a monarchy. More topically, it also occurs when ruling elites who originally had to compete for their factors of production – because of a sudden expansion in the borders within which they can dictate economic policy – suddenly trap the previously competed-for factor owners within their borders (Thompson-Hickson, Ch. 2, Part II).

In either situation, a regressive trend in the tax structure will arise in a movement characterized by decreasing ruling-class humanism. This trend generates a decreasingly egalitarian distributional equilibrium between the ruling class and ordinary people. Increasingly taxed workers and small business-people, who initially have backward-bending long-run supply curves, will work increasingly long hours for decreasing before-tax and after-tax hourly returns as they devolve toward subsistence lifestyles (*ibid.*).

If a large number of small investors initially invested in financial assets side-by-side with ruling-class largest investors in an attempt to imitate them, it may be very difficult for a legally constrained ruling elite to redistribute away from these free-riders even though they want to. In this case, a special set of policies must be designed to accomplish the redistribution. These policies induce many small investors to jump on a bandwagon, which is then abandoned by the more informed ruling class, leaving ordinary people with radically reduced wealths due to the borrowing they did to participate in the contrived asset boom.

Besides the middle-class's triple-hit of rising taxes, declining before-tax incomes, and large stock-market losses, large personal real-estate losses are also in store for the no-longer-competed-for middle class. Because a willingness to invest large amounts in the stock market ordinarily presupposes the possession of residential real estate, large real estate losses are rationally the last to create. Nevertheless, because these redistributions cannot be expected to fully confiscate these real assets from the middle-classes in a single bubble, what we expect here is actually a series of appropriately spaced bubbles. Besides increasing middle-class tax rates and correspondingly decreasing wage rates, what we expect here is an alternation of financial-asset and real estate bubbles in an extended era that historians would later characterize as an era of "widespread economic fraud and market instability." The cumulative result

would be an immense shake-out, leaving most assets in ruling-class hands.

While sequences of governmental decisions are responsible for some real estate bubbles, the government does not generally supply the hype that creates these bubbles. Rather, it supplies legal "reforms" that decrease the legal punishments that ruling-class promoters face for various offenses against ordinary people, who are initially unaware of the subtle change in the incentives of investment promoters. Although the governmental cause of the resulting series of fraudulent laissez faire promotions may become subsequently obvious to the victimized middle-class, no serious consequences will follow from their *ex-post* insight. In contrast, we have seen, the fraudulent promotions designed to redistribute away from imminent revolutionaries are restricted to a form that can be plausibly attributed to private promoters who appear to deceive *both* the victims and the ostensibly well-intentioned ruling elite.

These and other detailed implications regarding the differential bubble characteristics resulting from different distributional disequilibria will now be evaluated in a series of historical applications. We will also use the theory to predict bubbles that both have occurred and are about to occur.

IV. HISTORIC BUBBLES AND BUBBLE-SUBSTITUTES

A. European Revolutions and their Deterrence.

1. *Predicting Revolutions.* Prior to the emergence of stock markets in the various nation-states of Europe from the 17th through the 19th centuries (Neal), revolutions in non-repressive nations were easy to foresee. As predicted by the above theory of efficient revolution, when a nation's debt rose to a sufficiently high level, a revolution would rationally occur in order to relieve the state of its high debt and give it a clean slate. Early modern England's first civil war, the War of the Roses, was thus the predictable result of the near-bankruptcy of the House of Lancaster at the end of the Hundred Years' War. The refusal of Lancaster to quickly yield in this civil war meant the eventual bankruptcy of the initially liquid, debt-repealing, House of York, which resulted in the military ascendancy of the similarly debt-repealing Tudors at the end of this financially debilitating war. The Tudors held the throne well beyond the massive deficits of Henry VIII. But this was only because of the clever decision of Queen Elizabeth to remain barren, in

which case the militarily stronger Stuarts could assume the Crown through legal inheritance rather than costly religious strife and bloodshed. While the high-spending early Stuarts steadily accumulated a huge national debt, their rational bubble in the early 1620's, discussed in Section B below, made it quite difficult for the Stuarts to trap the relatively sophisticated Whigs into another bubble. The result was Parliament's revolution in response to the enormous debts mounted by Charles I. Following the failure of Cromwell's theocracy and Stuart restoration, an almost identical revolution then occurred against the wildly borrowing James II. The militarily ascendant house legally rejected the high debts accumulated by the previous house in every case in which the new monarch was not represented as a legitimate heir to the throne.

France, which had just completed its centralization into a modern nation-state by the beginning of the 16th century, had no organized markets for investment shares when the first threat of revolution predictably emerged in the middle of the 16th century because of ballooning national debt during its prolonged war with the Spanish Habsburgs from 1520 to 1557 (Briggs, p.5). With no possibility of staging a bubble and no apparent bubble-substitute available (torture was removed as a strategy with the transfer of heresy trials to the Parliaments in 1539 (Briggs, p.12)), France was immediately hit by over thirty years of revolution, which ended with the ascendancy of Henry of Navarre in 1592. Although Henry had inherited the throne, he was able to claim that he was from the Bourbon rather Valois family, which enabled him to legitimately repudiate a huge portion of the national debt and thereby complete the lengthy revolutionary process (Bonney, Ch. 1, Briggs, Graph 6). The subsequently low national debt in the early 17th century brought stability to France. The Thirty Years' Wars, however, brought on another effective bankruptcy by its end in 1648. Predictably, what immediately followed was the famous "Fronde," which, like the ascendancy of Henry of Navarre, gave France a legal excuse for repealing most of her huge debt. In this case, the alleged treason of the Regent, Anne of Austria, and her consort, Mazarin, was held responsible for the debt run-up (Briggs, pp. 126-136), in which case the exile of the couple was treated as tantamount to a debt-repeal-justifying "revolution" (Bonney, Ch. 5), which was aptly named after a fashionable child's game in which the youthful participant's threw dirt-clods at the wheels of the carriages of the nobility.

We will pick up the above two sequences in the next two subsections. There, we will see how the emergence of a widespread market for shares in joint stock companies gave subsequent national leaders an opportunity to respond to visible threats of revolution by the timely creation of stock-market bubbles.

The Netherlands, also forced to the point of bankruptcy in the increasingly expensive wars with France, 1521-1559 (Tracy, pp. 75, 127, 205), then suffered the revolution that eventually ended with an independent Dutch republic in 1602.[12] Although the old internal debt was not repealed, the formation of the new state was accompanied by a confiscation of the properties of the previous ruling elites that appears to have been sufficient to cover the accumulated debt (Tracy, pp. 204-5). While 17th century Holland was the first nation to accumulate a substantial long-term debt (Ferguson p. 113), she was also born with the first national-debt-holding central bank (*ibid.*). With such a fortunate birth, Holland has predictably never suffered from either a serious revolutionary threat or a genuine bubble (Tilly, pp. 67-74).[13]

Holland did not invent the institution of a government-debt-holding central bank. Several years earlier, the duchy of Venice had adopted such a bank (Ferguson, *op.cit,*) and, like Holland, has subsequently been remarkably free of both revolutions and bubbles.

The modern nation-state of Sweden was established in 1523 when Gustav Vasa led a similarly debt-retiring revolution against the least-popular property owners, the Catholic Church and rival aristocrats. What followed – up until the formation of a debt-holding central bank in 1688 (Ferguson, p. 114) by Charles XII, the last of Sweden's "great" warrior kings – was a long series of militarily aggressive, ill-fated kingships, ending, if not in premature death at war, in high-debt-based revolutions by alternative descendants of Gustav Vasa. The post-1688 enhancement of internal security soon generated a much

---

[12] The revolution was slow to develop. Charles V had earlier revived the inquisition in the Netherlands so that the landed aristocrats who began the uprisings encountered the tortures employed against those with Protestant leanings (Young, Ch. 5). The rebellion did not radicalize until the Pacification of Ghent in November 1576, which ended the inquisition and thereby caused the revolution to immediately spread the cities (Young, Ch 8; Blockmans).

[13] The famous "tulipmania" was an artifact created by overly dramatic contemporary financial reporters and an early 19th century popular historian, all of whom failed to distinguish futures prices from exercise prices for a way out-of-the-money option (Thompson-Treussard). It was not a bubble in any economically relevant sense. of the word.

stronger Parliament and Sweden's "Age of Freedom." Although this democracy was insufficient to handle its external defense (Thompson-Hickson, pp.165, 168, and Ch. 4) and thereby handed Sweden back to an authoritarian leader in 1772, the national-debt-holding central bank remained; so revolution remained a thing of the past. While a long sequence of assassinations and liberal reforms occurred before a defensible constitutional democracy was established in the middle of the 19th century, revolution, or internal warfare to take control of the government to legitimate a new distribution of wealth, never occurred after 1688.

Denmark and Norway had been in a political union, the Union of Kalmar, with Sweden until the Vasa-led secession and Reformation of Sweden. After an auspicious beginning from 1397 to 1412, Denmark and Sweden were constantly rebelling against one another as they took turns being the soon-financially-strapped dominant state in the externally aggressive, debt-incurring, often unsuccessful, Union. The modern nation-state of Denmark, a hegemon over Norway up until the end of the Napoleonic Wars, was a bi-product of Vasa's separatist Protestant revolution. Militarily and financially more conservative Denmark used its own huge 1536 Reformation windfall as a reserve to retire debts up until its own adoption of a national-debt-holding central bank in 1736. Denmark has correspondingly remained a uniquely internally stable, revolution-free, nation-state. The house of Oldenberg has continually provided Denmark's monarch since 1438, making Denmark the modern world's oldest continuous monarchy.

2. Early Bubble-Substitutes. Meanwhile, the Roman Catholic states of southern Europe used the Church's desire to maintain its monopoly over religion to punish rebellious types through tortuous "inquisitions" and thereby maintained remarkably high internal security levels despite their high levels of borrowing. Early-modern (1480-1780) Spain and Austria thus featured highly debt-accumulating, often defaulting, monarchies that were exceptionally free, perhaps too free, of national revolutions.

Thus, in contrast to her northern neighbors, who protected potentially rebellious aristocrats with trials by independent legal professionals, Spain introduced, in response to her massive but still-growing national debt and correspondingly soaring interest rates and increasing threat of revolution during the 1520s (Le Flem), her notorious inquisition granting its politically connected Church the power to torture

politically dangerous people without the need for a trial by legal professionals (Kamen, pp 70-3).

Austria, who soon thereafter adopted the same policy towards political dissidents, introduced a national-debt-holding central bank in 1762 (Kindleberger, p. 131) and, during the succeeding 25 years, under the humanistic influence of Maria Theresa and Joseph II, effectively eliminated her harsh inquisition

Similarly, as Spain introduced a debt-holding central bank in the 1780's (Hume, p. 409), she also began an accelerating decay of her own inquisition through a Crown decision that civil offenses were to be tried by civil tribunals (*ibid.*, p 403). However, by 1814, with a steadily growing debt threatening the Crown's ability to service its debt and thus maintain the solvency of its central bank, Spain reinstated her inquisition. Although the state remained stable for another few years, in 1820, popular pressures against the new inquisition and burdensome taxation, including a failure to pay her armies, resulted in a new Constitution spelling both the final demise of the inquisition and a lighter tax load (Carr, p. 125; Hume, pp 345-346). This predictably led to a Spanish default on the national debt and corresponding bankruptcy of the Spanish Central Bank in 1822 (MacDonald, p. 370; Smith, p. 313-19), thereby generating (in 1822-23) the first revolution against the Crown in modern Spanish history (*ibid.*, pp. 304-5).[14] Spain then set up a new debt-holding central bank, which survived until the occurrence new state defaults from 1834 through 1841 (MacDonald, *ibid.*, Carr, p. 171), during which time a second series of intermittent revolutions began. This lasted until 1869, when Spain's first Constitutional Republic finally introduced more modest government spending and tax rates and a therefore-viable debt-holding central bank (*ibid.*, p.375).

3. Revolutions and Early Bubble-Substitutes: A Summary. Thus, prior to the emergence of a national market in the shares of the joint stock companies, the fledgling nation-states of Europe engaged in either: (a) qualitatively efficient, regime-changing, revolutions in order to restore its emergency borrowing power in the face of a recently expanded, huge, royal debt; (b) inquisition and torture in order to repress the otherwise certain revolution while high taxation and forced loans kept the often out-dated, religiously

[14]The reason we are not predicting a bubble rather than a revolution here is that the rebels included an overwhelming portion of the financially sophisticated members of the Spanish Parliament (Smith, pp 302-4).

ideologized, monarchies in place; or (c) solvent, national-debt-holding, central banks and domestic peace.

In general, revolution was a common occurrence in 16th and 17th century Europe and then fell to relative insignificance in the subsequent centuries, as documented in the most systematic historical study of the subject (Tilly).[15] Of course, our explanation for the sea change is that stock markets and debt-holding central banks rose from insignificance to pervasive European institutions during the 18th and 19th centuries.

4. Predicting History's Famous Bubbles. The two most famous bubbles in economic history are the "South Sea Bubble" and the "Mississippi Bubble." Another, less famous but theoretically equivalent, bubble was the U.S. "Panic of 1792." Although others writing on historical bubbles, not seeing the basic rationale behind these bubbles, describe them as separate episodes, we have no reason to do so. Rather, we point out that these three episodes were all highly predicable in that standard bubble histories tell us that each one of these bubbles satisfied the same necessary and sufficient preconditions for a rational bubble.

Each observed bubble satisfied the necessary precondition of a lack of a government-debt-holding central bank. As we have seen, most countries – virtually all of Europe other than England and France – introduced government-debt-holding central banks prior to stock markets and therefore had no bubbles.

Each observed bubble also satisfied the theory's necessary precondition in which the country had no inquisition. The strong parliaments and secular legal ideologies of England, France, and Non-Spanish America had, by the time of their bubbles, eliminated their earlier systems of torturing political rebels.

Each observed bubble satisfied the theory's sufficiency precondition in which a recent increase in an already stifling government debt occurred. In the English and French cases, it was the same war, the highly expensive War of the Spanish Succession (1701-14), which followed their similarly expensive War of the Grand Alliance (1688-97). In the U.S. case, Alexander Hamilton had just announced that the new U.S. Government was assuming the debts of the previous U.S. governments, state as well as federal, despite the absence of a system of federal taxation other than customs duties. Furthermore:

---

[15]Although several of Tilly's "revolutions" were actually secessions or the result of foreign attempts to gain control of the country and not relevant to the subject at hand, once these wars are removed from the list, there remain an extremely large number of 16th and 17th century revolutions.

Each bubble was preceded by unmistakable signs of revolution. Jacobite uprisings and urban tax riots threatened a debt-strapped England. Uprisings in Brittany, Pro-Spanish conspiracies, and similar tax-riots threatened a bankrupt France. The revolutionary character of the Anti-Federalists was reflected in Philadelphia's Whiskey Rebellion, from Hamilton's 1790 expressions of serious fear of revolution, from his concentration of the bubble in Philadelphia and New York, the homes of Anti-Federalism.

Each bubble began with a series of government announcements making investments in a specific company appear very profitable and governmental failures to reveal its growing insider knowledge of the companies' inabilities to sustain their promised dividend yields as prices rose. Besides the systematic withholding of negative fundamentals, this was done by a sequence of official announcements, each enhancing the value of the companies. Thus, in setting up her bubble, beginning in late 1718, France sold to the Mississippi Company, under favorable terms: The rights to the state's tobacco revenue; next Colbert's French East India Company; then the exclusive right to mint coins; and finally the right to collect almost all of France's taxes. In the process, the Crown received many shares in the Mississippi Company on which it would greatly profit. Similarly, following England's announcement of a plan to have the South Sea Company convert the public's illiquid bonds into liquid stocks, government-connected promoters provided the necessary stream of good news by regularly announcing, quite fraudulently, that the rapidly appreciating Company would be able to steadily maintain the same above-market dividend rate even though their prospective flows of net revenue per share were substantially falling, both fundamentally and relative to prices during the dramatic price run-ups (Scott, p. 325). To initiate the U.S. bank-stock boom of 1791, Hamilton merely had to announce a plan, likely pure deception, to transfer large parts of the national debt into various local branches, mainly in New York and Philadelphia, of the newly formed national bank.

Each observed bubble began by inducing the rebellious masses to take heavy positions in a company whose assets were largely government debt, thereby delaying the threatened revolution until a more durable solution could be devised. Both the Mississippi and South Sea Companies won their chartered monopolies by promising to hold large amounts of government debt received in exchange for

their new stock. The price boom and new stock sales ended once each company had accumulated almost all of the country's respective national debt and the bust would put the rulers in position to cheaply acquire the company, and therefore much of its debt, while appearing to be a white knight. The U.S. bubble was similarly fed by allowing the new bank issues to be purchased for government bonds at par value rather than cash, which was widely done, given the discount bonds received in the open market.

Each observed bubble was a manipulation by wealthy urbanites that victimized less financially sophisticated potential rebels. Furthermore, the Mississippi and U.S. bubbles were blamed largely on foreigners or social outsiders who became the scapegoats (John Law and William Duer, respectively), while England imposed only light punishments on her many vaguely implicated Members of Parliament.

Each observed bubble featured concurrent governmental efforts to set up a debt-holding national bank. France acquired John Law's bank, which was increasingly acting like a national-debt-holding central bank (Davis). The English Parliament had attempted to induce the Bank of England to hold long-term government debt, but the bank initially refused due to its already crowded portfolio and thus under-bid the South Sea Company for the right to exchange new stock issues for the privately held national debt at the birth of the South Sea Bubble in March 1720. And the U.S. Panic of '92 was caused by a bold change in Hamilton's announced plan, a reversal retaining the national debt in the coffers of the central bank.

Each bubble exhibited a flat spot at the top, thereby giving most of the insiders a comfortable opportunity to liquidate their positions. The Mississippi Company managed their flat spot by officially fixing the price of their stock and reducing the number of repurchases by announcing a substantially above-market dividend rate at this price while the South Sea Company and U.S. bank-stock promoters managed theirs with increasingly wildly optimistic announcements of planned dividend payments (*e.g.*, Carswell).

Each observed bubble resulted in the elimination of a serious revolutionary threat. The impoverishment of wealthy rebels, would-be financiers of revolution, occurred in every case. Moreover, the French Crown, although unfortunately liquidating it's fledgling debt-holding central bank, used it's immense trading profit from the Mississippi bubble to make itself the company's dominant creditor and

thereby both retire a large part of the national debt and reacquire its previous revenue-generating rights and in the bankruptcy proceedings (Theirs). The Bank of England picked up the debt of the desperate post-crash South Sea Company for a discount, thereby making itself a national-debt-holding central bank and ending the long series of English revolutions that had occurred up to that point. Similarly, the U.S. National Bank – upon abandoning the branches around which the booms centered, left insider-speculators even more wealthy at the expense of Anti-Federalist investors – became the chief holder of the U.S.'s debt and thus found itself immune from revolution despite the subsequently large increases in the national debt.

Finally, although our theory is rationality-based, we do not wish to attribute too much foresight to the policymakers. Evolution rather than insight may have fashioned the appropriate strategies of the ruling elites. Indeed, each observed bubble featured a two-stage, possibly quite myopic, process. In the first stage, the revolution-threatened elites employed hype to attract would-be rebels into speculative positions in companies establishing heavy positions in the national debt. In the second stage, the manipulated flat spot, the elites rationally bailed out before suffering the inevitable consequence of the initial hype. It is not clear how many of the bubble-creators foresaw the bubble that would follow from their initial hype.

5. The Exceptional Character of the French Revolution. As we have seen, France had a bad experience with its first attempt to establish a debt-holding national bank in the early 1720's and, probably as a result, failed to adopt a central bank for the remainder of the Century. The rapidly growing national debt of the late 18th century inevitably culminated in the French Revolution. A revolution-deterring bubble might therefore be predicted. Why didn't the bubble occur?

Our answer is that late 18th century France did not have an informed and rational government. In particular, the Enlightenment economic ideology that had captured the ruling elite made it excessively insensitive to the widespread suffering caused by their increasingly laissez faire policies (Thompson-Hickson, pp. 154-166). This governmental insensitivity was the direct cause of the predictably insufficient response of the French ruling elite to the growing threat of a revolution. This insufficient response of the ruling elite to the threat of revolution manifested itself in several forms. First, the Crown predictably

stepped-up their use of oppressive arrest and torture of relatively wealthy rebels. But, also predictably, Royal oppression was eliminated, first by the pressure put on the King by the even more determined, torture-eliminating, Assembly of Notables in 1788 and then confirmed by the National Assembly in 1789 (Mellor, 190-192). Second, in the late 1780's, the government suddenly chartered several new companies, whose stock prices steadily rose to attract several wealthy rebels with corresponding governmental market manipulations (e.g. Taylor, pp 951-977). But, again predictably, the bubble was aborted in March 1787 by the wealthy rebels in the Assembly of Notables, who were sufficiently driven relative to the King to succeed in putting a halt to the fledgling bubble by forcing the chief governmental promoter to promise to compensate the possible losers from the scheme (Taylor, *op cit.*). Finally, friends of the King organized a debt-purchasing central bank in 1789 that would have deterred the revolution. But the approval of the bank's charter was vetoed in the last minute by the pro-revolutionary National Assembly on the basis of the excessive power it would grant to the King. In each case, both the Crown and the rebels acted completely aware of the power of our three revolution-deterring institutions. But the revolutionaries, who had been substantially victimized by the economic policies of the ideologized ruling elite, were far more motivated to abandon these laissez faire policies than the economically "Enlightened" elite thought they were.

B. A Suddenly Diminished Concerns for the Middle Class.

1. The Crisis of 1620. **(a) Predicting the Bubble.** Joint stock companies began their flourishing history in mid-16th century England. The original companies were formed out of monopoly grants from the Crown in return for cash or a share in the revenue. Limited liability and negotiability greatly attracted England's middle-class investors to shares in a company's risky foreign venture, usually a trade voyage.

In 1603, James I, an extravagant Scot who had little sympathy for the English upper-middle class, ascended to the English throne. James would have substantially increased domestic taxes had Parliament not stood in his way. While his increasingly consumptive court initially lived off of revenues from increasing tariffs, this source of growth reached its limit around 1610. Thereafter, revenues from grants of monopoly charters accelerated as many burgeoning joint stock companies began representing themselves

as permanent investor organizations rather than merely specific joint ventures. The high average rates of return on these specific ventures, typically around 100% per annum (Scott, Vol 1, Ch. VIII), were thus coming to be thought to be steadily reproducible by the new joint stock companies. The late 1610's thus featured a boom in the stocks of these companies (*ibid.*,p.166). The ruling elite also benefitted from the boom in that company promoters required connections to the crown in order to obtain monopoly charters.

While a more benevolent ruling elite (such as possessed by their Dutch contemporaries) would have relaxed and enjoyed its increasing prosperity, James' court could not resist the myriad opportunities to redistribute away from England's middle-class investors. Both the King, through his increasing control of the law and deceptive charter policies, and the managerial elites – through their own private hype, accounting fraud, and excessive salaries – were setting up the conditions for a stock-market bubble.

Besides introducing several, essentially illegal, indirect taxes during the 1610's (Scott, Vol. 1, Ch IX), James was succeeding in his attack on the Common Law courts, whose charge was to protect the small property owners from the ruling class. These courts had lost their predominance during this decade as the Lords-run Courts had just gained the status of a court of last appeals. Ruling class defendants could rest assured that they would receive sympathetic hearings. James predictably exploited his new opportunity to abuse his right to grant monopoly charters. And the similar-minded ruling elites exploited their new opportunities to hype new projects of the Russia, East India, and recently formed Virginia Companies.

During 1620, the public became increasingly aware of the fact that King could rescind and resell his own monopoly grants (Scott, p. 178). For, as was becoming public information, he had already just done this with the largest trading monopoly, the New Merchant Adventurers, and their monopoly in the cloth trade. The disastrous consequence was the stock market crash of 1620 (Scott, Ch. IX).[16] The major

---

[16]The King, in 1614, in the name of economic development, effectively rescinded the charter of the highly successful Merchant Adventurer Company by outlawing the export of undyed cloth and then, for about 1/3 of the profit, chartered a new company, called "The New Company of Merchant Adventurers," promoted by his insider-associates led by one William Cockayne. The new company was to export the same cloth as would the old, only dyed to fetch a higher price. The scheme was an immediate economic failure. However, the King then forced the old company to make huge informal payments to the court in order to restore their charter (Scott, Ch. VII.). The stock market decline unfolded in 1619 and 1620 as the details of the operation and the resulting decrease in profits of the Company became public information.

concern of the understandably agitated Parliament of 1621 was not the stock crash and beginnings of the fraud investigations. Rather, it was the problem of monopoly. The seeds of the England's famous 1624 statute of monopolies, which eliminated all governmental grants of monopoly rights except for new discoveries, were sown by this Parliament. Fearful of having their charters rescinded and resold to others, the investors came to see that their best strategy was to eliminate their **own monopoly charters**, thereby trading, for the ancillary benefit of the consumers, their fragile monopoly rights for first-mover advantages.

(b) Predicting the Bubble from a Broader Social Perspective. Recall that bubbles resulting from a decreased concern for the middle class are part of a sequence of policies, the first being a tax-hike on laborers and resulting decrease in their real wages, the second a stock market bubble, and the third an attack on middle-class real estate holdings. Note that, both theoretically and empirically, the period of decreased concern for the middle classes runs the 140 year period from Henry VIII's profligate administration to the English Civil War. The fundamental basis of the sequence was not James I and Charles I's Scottish sympathies, which increasingly stripped the matter of all of its prior niceties and made the progressive redistributions more and more visible. Rather, the basis of the sequence was England's military-technology-induced switch from a citizen national army to an expensive professional army, one capable of manning the expensive and complex cannon and firearms of the period. England's citizen national armies returned from the 1640's through the 60's with the advent of flintlock firearms, which could be managed by a single marksman with a modicum of training. After that, the middle-class tax-load lightened and artisan wages rose toward historically normal levels (*e.g.* Phelps-Brown and Hopkins.).

An easy way for an economist – even one unattuned to the social determinants of the distribution of income and the bubble-creating features of certain legislative acts – to predict a bubble from this broader perspective is thus to identify its economic precursors. The first is a tax-hike-induced decrease in real

---

The possibly induced decline in investment cannot explain the strength of England's depression in the early 1620's. While there are several popular theories of the depression, various accounts (especially Gould, and Scott, Ch IX) reveal only one, apparently ignored, rational sequence. It is that James had, in 1620, received a final, balloon payment on a previous loan of Queen Elizabeth to Holland. Raising the pounds necessary to make the payment caused the pound to appreciate relative to the Dutch Guilder, a Dutch export boom and a corresponding slump in England, lasting for several years because of the 1620 Dutch borrowing to finance the payment.

wages. Thus, there was a 60% decrease in real wages from 1510 to 1620 (*ibid.*), first through a decreased number of holidays, then through the successively stricter laws controlling the free movement of labor (*e.g.* Woodward), and then through increases in tariffs and indirect taxes (Scott, *op. cit.*)

The next precursor is legislation decreasing the punishments on wealthy promoters and privately engineered bubbles. This occurred, as noted above, in the imposition of Equity over Common Law courts during the 1610's, marked by the 1616 dismissal of the champion of the Common Law, Sir Edward Coke, as England's Lord Chief Justice (*e.g.* Bowden, pp. 294-363). What immediately followed, besides the King's regulatory deception effectively rescinding the Merchant Adventurer Company's charter, were simultaneous accounting and managerial frauds in the Russia, Virginia, and East India Companies (*e.g.* Scott, Vol. II, pp 56-8, 267-82; and Bowden, p. 344, respectively) as well as Ponzi-type dividend payments in these companies. The resulting bubble was a predictable outcome of the King's desire to redistribute from the trend-following middle-class investors to his ruling-class officials and insider-investors.

The final attack on the middle-class was predictably against their land holdings. This occurred in the early Stuart anti-enclosure movement that slowly began its rise in the reign of James I and accelerated under Charles I. This final redistribution away from the middle class, regarded by many authors to be a central cause of the English Civil War,[17] helps assure us of the redistributive basis of the prior bubble.

2. Predicting Modern Bubbles. 1990 was a watershed in world history. The Cold War had just ended. The West, in particular its leader, the U.S., had won. Leading Western nations no longer had to compete with the East "for the hearts and minds of men." As discussed in Section III.B.3, both theory and history teach that states that need not compete for people do not, in long run equilibrium, provide significant surpluses for their masses. In equilibrium, the ruling elites are the only substantial surplus recipients when states do not compete for people. Middle-class taxes rise, and wages and small business profits fall, under the impetus of a shock favoring the ruling elites. The movement in this direction in the

---

[17]The English Civil War thus began as a predictable revolution against a bankrupt government that had already exploited its bubble weapon. However, it became a social revolution with egalitarian implications with the re-emergence of a military technology, the "New Model Army," in which ordinary citizens were useful as soldiers.

U.S. and U.K. since the early 1990's has been widely reported and needs no elaboration here.[18] Since this tax policy cannot be counted on to redistribute capital and land away from the middle classes, redistribution-oriented stock-market and real-estate policies should successively follow the wage trend.

The deception setting up the stock-market bubble occurs, as argued in Sections III.B.1-3, through legal "reforms" ostensibly improving the administrative system but known to insiders to facilitate hype and exaggeration. A publicly little-noticed act of a conservative legislature, entitled "The Private Securities Legislative Reform Act of 1995," which passed over a presidential veto after an extensive lobbying campaign by Wall Street and the computer and accounting industries(*e.g.* Frank, Giron), allowed companies to refuse to reveal information that might damage their competitive position. The Act suddenly made it extremely difficult to sue corporations, their managers, and their accountants for making deceptive statements about the hyped companies. While the Securities Exchange Commission should have expanded its fraud enforcement efforts in response, it contracted them under the same political pressures. The Supreme Court apparently laid the foundation for the movement by eliminating the right of shareholders to name accountants, lawyers, and bankers as aiders and abetters in fraud suits (Giron). These roughly simultaneous pro-hype policies rolled out a welcome mat for the predictable stock bubble that ensued.

More stock bubbles are very likely. The fraud law remains predictably lax and the redistributions we have recently experienced have nevertheless left a good part of the nation's common stock in the hands of the middle class. However, it takes quite a while for stock investors to regain their confidence in the market sufficiently to repeat their original, momentum-playing, errors. While the ruling class is waiting for this to occur, there are other markets to manipulate. In particular, even though their ideal time to create

---

[18]The negative real wage trend began in the U.S. in the mid-1970's. Precipitating that shock was the loss of the War in Vietnam and corresponding switch away from a conscripted civilian army to an all-volunteer army. The correspondingly higher middle-class tax rates and reduction in expenditures on education and welfare reduced U.S. wage rates. While the end of conscription may have compensated for this loss, nothing has compensated for the middle-class tax increases and corresponding real wage reductions we have seen since the end of the Cold War.

Also, the labor-intensive computer industry boom of the late 1990's, which turned into a bubble, created an extraordinary increase in demand for computer specialists that temporarily increased the U.S. real wage level, which rose even further after the bubbles burst in 2000 because of the resulting recession and increased in the real wage rate. We regard these as temporary phenomena obfuscating the long-term downward trend in U.S. real wages.

a real estate crash is not before the completion of the stock crashes, time preference may lead them to at least set up a real estate bubble while they are waiting for confidence to return to the stock market.

Indeed, it appears that a real-estate bubble is currently in the works. The unfortunate lack of a positive monetary response to the 2000 and 2001 recessionary aggregate-demand shocks created a three-year downward drift in real profit rates and long-term real interest rates[19] and corresponding upward trend in real-estate prices relative to rentals. Although real residential real-estate prices should have fallen in response to the recovery-induced increase in long-term interest rates since the Summer 2003, these prices are continuing to rise. This reflects trend-following demand in the residential real estate market, which must have also been present earlier, as also evinced by the over 35% rise in real residential real estate prices over the past nine years (from CPI-deflating Freddie Mac's Conventional Home Price Index for the first quarter of 2004 relative to the first quarter of 1995) vis-a-vis the relatively anemic 10% rise in real rents over this period (from the BLS real rental cost index for the first quarter of 2004 relative to it value in the first quarter of 1995) despite the approximate constancy of the relevant long-term real interest rates over this period.[20] Thus, unless expected future U.S. construction costs (including land prices) relative to present construction costs has inexplicably jumped, we are currently experiencing a real estate bubble.

APPENDIX I: Efficient-Market Prices Unsystematically Converge to an Equilibrium.

Let $x_{it} \in R$ represent the excess demand for the good i in period t, where i runs from 1 to n and t

---

[19]Facilitating this movement toward lower interest rates was the Spring of '03 bond-market boom fueled by irresponsible rumors of impossibly low long-term interest rates that drew in an unprecedented number of non-professionals, innocent trend followers, into the bond market until the bubble burst in June, greatly enriching a large number of already-wealthy professional bond market traders and market executives.

[20]The relevant interest rate is the real long-term, insured, tax-exempt (municipal) bond rate. What makes this the relevant rate, although other rates are more typically employed to discount the value of housing services, is that it is the only rate that has the same tax treatment as housing investments. Like home ownership, municipal bonds do not have their income taxed, do have their capital gains taxed, and are typically held for several years.

Also, the relevant house price-index, an index that would reflect the average quality of rental units rather than houses, is not the Freddie Mac Index reported above but the lower-house-quality index given by condominiums, particularly low-priced condominiums. Available mid-2004 data from the National Association of Realtors (and that reported by Harney) indicates not only that have median condominium prices been increasing relative to house prices, but also that the prices of the lower-end condominiums have been increasing faster than median. So the numbers reported in the text are conservative estimates of what appears to be a substantial real estate bubble.

from 0 to infinity. We think of the goods as completely durable and preferences as stationary, the purpose of the time dimension being to allow for the consideration of disequilibrium behavior. The excess demands are continuous functions, $x_i(P_t)$, of the prices of the first n-1 goods relative to the nth, whose price is unity, where $P_t \in R_{\geq 0}^{n-1}$ denotes the non-negative n-1 dimensional vector of these prices, $(p_{1t},\ldots,p_{n-1,t})$, and X_t represents the corresponding vector of excess demands. A competitive equilibrium is achieved once prices (from t onward) are such that $X(P_t) \leq 0$ and $x_{it} < 0$ implies $p_{it} = 0$. Since the nth good always has a positive price, Walras' identity (wherein the sum of the values of the excess demands in each period are identically equal to zero), assures us that $x_{nt} = 0$ in equilibrium. Such a P, call it P^*, and the corresponding competitive equilibrium quantities can always be found (Arrow-Hahn). We assume that these equilibrium prices and quantities are unique.

Individuals do not initially know the equilibrium prices. A price and corresponding excess demand path is said to converge whenever $\lim_{t\to\infty} X_t \leq 0$, and $\lim_{t\to\infty} X_t < 0$ implies $\lim_{t\to\infty} P_t = 0$. More specifically, what we want to prove here is that prices and corresponding excess demands **unsystematically** converge. This is stronger than convergence, or "stability" (or uniform convergence or asymptotic convergence) in that familiar stability concepts permit predictable booms and busts or secular price trends. Such continuous price adjustments create predictable price trends, which are inconsistent with rational speculation under symmetric information (or "efficient markets). Even the small price changes occurring close to equilibrium continue to jump to a common expectation of what would be market-clearing rather than following predictable trends.

Since our interest is in a single, possibly bubble-infected, market, we concentrate on a single market, say the market for good 1, relative to the numeraire, good n. The good's corresponding price movement is potentially an order-of-magnitude larger than that of other goods. Consequently, we simplify the dynamic analysis by assuming that other markets equilibrate around the market for good 1. In

particular, for all i, $n > i > 1$, P_t varies so that, $x_{it}[P_t(p_{1t})] \leq 0$ and $x_{it} < 0$ implies $p_{it} = 0$, whereas the sum of the values of these implicitly determined $n - 2$ excess demands is equal to zero.

As explained in the text, we assume a discrete learning form, $p_{1t} = p_{1t-1} + f[x_1(p_{1t-1})]$, where $f[\cdot]$ is: (a) homogeneous so that $f[0] = 0$, (b) continuously differentiable, and (c) monotone increasing so that $f' > 0$. Note that once an equilibrium is reached, $X_t = X_{t+1} = X_{t+2} \ldots$.

Unsystematic convergence of the price of good 1 occurs because the successive price changes amount to ever-more refined Taylor approximations of the $f[x_1(P(p_{1t})]$ resulting from successive observations of points on the function. Thus, the initial period soon reveals an exact pair of points on the excess demand function, x_{10}, p_{10} (or $x_{10}, p_{10}, p_{20}(p_{10}), p_{30}(p_{10}), .., p_{n0}(p_{10})$), and $x_{11}, P_1(p_{11})$. From these, individuals can measure the first order effect of x_1 on its subsequent quantity as well as its price. Since higher order moments cannot be assumed *a priori* to be positive or negative, a linear approximation would furnish an unbiased estimate of f. If f were actually linear, then p_{12}, the linear extrapolation of the existing relationship to the point that $x_{12} = 0$, would exactly clear the markets in period 2. The subsequently observed price vector, P_2, and the $x_1(P_2)$ that it actually generates, produces a third exact point on the mutatis mutandis excess demand function from which to estimate the $f[x_1]$ function. Since higher order moments still cannot be assumed *a priori* to be positive or negative, the expected P_3 esimated from a quadratic approximations of f provides a second unbiased estimate of the price that will satisfy $x_1 = 0$. The subsequently observed p_3 and x_3 will provide cubic approximations of f, *etc.*. This continual refinement of the estimation of f continues until the exact polynomials are the correct ones and the correspondingly observed x_{1t} values are the expected x_{1t} values for all goods or the process

continues on forever coming closer and closer to the exact one. That is, since the resulting Taylor expansion of the function of the positively priced commodities around $x_1 = 0$ is convergent (*e.g.* Rosenlicht), the equilibrium is both stable and has the property that $E(P_t) = P_t$ for all t.

Related, but informationally more demanding, attempts to obtain a general convergence result, based on variants of Newton's less robust method of successive approximations rather than Taylor's Theorem, can be found in Smale, Saari and Simon, and, most pointedly, Bala and Keifer. Although Bala and Keifer have shown, in essentially the same single-market setting as the above, that there is a generalization of Newton's method that, like ours, leads prices to universally converge, the algorithm does not result from a successive application of individually rational, efficient-market, decisions.

APPENDIX II: Trading at False Prices Generates Convergent Martingales.

Now let us allow sellers time to sell significant amounts at the initial prices. The resulting trading at "false" prices creates income effects that shift the excess demand functions as trading proceeds. Hence, building upon the economic model of Appendix 1, we now allow excess demands to depend upon previous unexpected price changes. Maintaining, our special-purpose assumption that other prices equilibrate to p_1, this assumption simplifies the excess demand function to $x_{1t} = x_1(P_t(p_{1t}); \Delta P_t(p_{1t-1}), \ldots, \Delta P_1(p_{10}))$, where Δ is a first difference operator from the previous to the current period. The above continuity assumption is extended to the Δ variables because the redistributional effects and allocational losses created by trading at false prices shrink with the extent of the price changes. And, since these effects and losses cease once an equilibrium has been reached, the excess demand function is homogeneous in past price changes. In particular, $x_1(P_t(p_{1t}),0,..0,\Delta P_{t-s},..,\Delta P_1) = x_1(P_{t-1}(p_{1t-1}),\Delta P_{t-s},..,\Delta P_1)$, where s represents the number of consecutive prior periods that prices have not changed.

Price adjustment is, following the rational Walrasian form discussed in the text, described by $\Delta p_{1t} = g[x_{1t}(P_t(p_{1t}))]$, where $g[\cdot]$ has the same homogeneity and monotonicity properties as $f[\cdot]$ above.

Similarly, an equilibrium here is achieved once p_{1t} satisfies $x_{1t}(P_t(p_{1t})) = 0$, although there is generally an infinity of such p_{1t}'s given the infinity of possible, essentially random, distributional and allocational effects on the dynamic path. In any case, from the homogeneity of $g[\cdot]$, once such a price is achieved, $\Delta p_{1t} = 0$, and it remains there in an equilibrium because of the homogeneity of $x_1(\cdot)$. Now, rational Walrasian price adjustment, from the text, is a martingale in that $E_{t-1}[p_{1t}] = E[p_{1t}|p_{1t-1},.., p_{10}] = p_{1t-1}$. But convergence is another matter. Random-walk prices, for example, are martingales. What will makes price converge here is that the allocational and distributional effects responsible for the random demand variations shrink as prices approach equilibrium levels.

From the law of large numbers, it is virtually certain that $|x_1(p_{1t})|$ will sometimes be less than a small positive number, say ε. Suppose that this occurs at time s_1. The false-trading-induced demand shifts have a zero mean and a variance of the can then be represented as $v(s_1(\varepsilon))$, where $v'(\varepsilon) > 0$ and $v(0) = 0$. Continually linearly approximating the systematic part of the $x_1(p_{1t})$ function with the x_1, p_{1t} observations beyond s_1, justifiable because of the relatively small ε, yields a string of increasingly statistically significant estimates of this systematic part, and therefore smaller and smaller expected errors, in the continuing attempt to find a p_{1t} that will yield a zero error. Thus, although subsequently setting a tighter approximation band than ε, say $\frac{1}{2}\varepsilon$, will require an additional number of observations, $s_2(\varepsilon/2)$, to yield an excess demand within this tighter range, the probability of reaching $s_2(\varepsilon/2)$ increases over time at an increasing rate. This is not only because of the increasing efficiency of the estimator, but because the lower $v(\varepsilon)$ due to the decreased x_{1t} increases the likelihood of randomly achieving such a low excess demand. This statistical variant of Newtonian approximation continues, ad infinitum if necessary, each 50% reduction in the approximation band again being achieved in decreasing expected time intervals because of the ever-smaller error variances as the excess demands are decreased. Even if

x_{1t} does not hit zero in this entrapment process, in the above contraction process, $\lim_{t\to\infty} x_{1t} = 0$. Thus, although p_{1t} is continually chasing a moving target, once it gets sufficiently close, convergence to an equilibrium occurs because the target approaches stationarity as p_{1t} closes in on it.

REFERENCES

Aggarwal, R,and Wu, G, "Stock Market Manipulation–Theory and Evidence," Dartmouth WP, 2003, 1-41.

Ahn, D; Boudoukh, J; Richardson, M; Whitelaw, R, "Partial Adjustment or Stale Prices: Implications from Stock Index and Future Return Autocorrelations," *Review of Financial Studies*, 15, 2, 2002, 655-89.

Azariadis, Costas, "Self-Fulfilling Prophesies," *Journal of Economic Theory*, 25, 1981, 380-396.

Allen, F. and Gale, D., "Stock Price Manipulation," *Review of Financial Studies*, 5, No.3, 1992, 503-529.

Allen, Franklin; Morris, Stephen; and Postlewaite, Andrew, "Finite Bubbles with Short Sale Constraints and Asymmetric Information," *Journal of Economic Theory*, 61, 1993, 206-229.

Arrow, K and Hurwicz,L,"On the Stability of Competitive Equilibrium," *Econometrica*, 26,4,1958, 522-52

Avery, C and Zemsky, P, Multidimensional Uncertainty and Herd Behavior, *American Economic Review*, 88, 4, Sept 1998, 724-48.

Back, K. and Baruch, "Information in Securities Markets: Kyle Meets Glosten and Milgrom," *Econometrica*, Vol. 72, No. 2., March, 2004, 433-65.

Bala, V. and Kiefer, N., "On the Existence of Universally Convergent Mechanisms," *Journal of Economic Dynamics and Control,"* 18, No.2, March 1994, pp. 299-316.

Benabou, Roland and Laroque, Guy, "Using Priveledged Information to Manipulate Markets: Insiders, Gurus, and Credibility," *The Quarterly Journal of Economics,* 107, No.3., August 1992, 921-958.

Blockmans, W.P., "The Formation of a Political Union, 1500-1600" in *History of the Low Countries*, Eds. Blom and Lamberts, Berghahn Books, NY, 1999, p. 137.

Bonney, Charles, *The King's Debt*, Clarendon Press, Oxford, 1981.

Bowden, C., *The Lion and the Throne: The Life and Times of Edward Coke*, Little Brown, Boston, 1957.

Briggs, Robin, *Early Modern France*, Oxford University Press, Oxford, 1998.

Carr, Raymond, *Spain, 1808-1939*, Clarendon Press, Oxford.

Carswell, John, *The South Sea Bubble*, Sutton Publishing, Gloucestershire, 2001, esp. p. 178.

Cass, David and Shell, Karl, "Do Sunspots Matter?" *Journal of Political Economy*, 91, 2, 1982, 193-227.

Chan, K,"A Further Analysis of the Cash Market and Stock Index Futures Market," *RFS*, 5,1,1992, 123-52.

Chan, Kalok, Chan, Louis K.C., and Karolyi, G., "Intraday Volatility in the Stock Index and Stock Index Futures market," *Review of Financial Studies*, 4, 4, 1991, 657-684.

Cheung, Y. and Ng, L, "Stock Price Dynamics and Firm Size," *Journal of Finance*, 47, 5, 1992, 1985-89.

Chancellor, Edward, http://www.prudentbear.com/press_room_short_selling_history.html.

Copeland, Thomas and Friedman, Daniel, "Partial Revelation of Information in Experimental Asset Markets," *The Journal of Finance*, 46, 1, March 1991, 265-295.

Davis, Andrew M., "An Historical Study of Law's System," *QJE*, Vol.1, Issue 3, April 1887, esp. 299-300.

Ferguson, Niall, *The Cash Nexus*, Penguin Press, London, 2001.

Foster F.D, and Viswanathan, S, "Strategic Trading with Asymmetrically Informed Traders and Long-Lived Information," *Journal of Financial and Quantitative Analysis*, 29, 4, Dec. 1994, 499-518.

France, Mike, "This Crash won't make Lawyers Rich," *Business Week*, March 26, 2001.

Garber. Peter, "Famous First Bubbles," *Journal of Economic Perspectives*, 4, No. 2, Spring 1990, 35-54.

Glosten, L. and Milgrom, P., "Bid, Ask, and Transaction Prices in a Specialist Market with Heterogeneoulsy Informed Traders," *Journal of Financial Economics*, 1985, 13, 71-100.

Goetzmann, W.N., "Patterns in Three Centuries of Stock Market Prices," *The Journal of Business*, 66, No. 2. (April, 1993), 249-270.

Girion, Lisa, "1995 Tort Reform Act Said to Provide Safe Harbor," *LA Times*, July 12, 2001.

Gould, J., "The Trade Depression of the Early 1620's," *Economic History Review*, 7, 1, Feb 1954, 81-90.

Harney, Kenneth.,"Condo Market is Hottest at Luxury and Entry Levels," *Miami Herald*, Aug. 31, 2003.

Harrison, Michael and Kreps, David., "Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations," *The Quarterly Journal of Economics*, 92, 2, May 1978, 323-336.

Hart, O.,"On the Profitability of Speculation," *Quarterly Journal of Economics*, 91, 4, Nov. 1977, 579-97.

Hermann, Christian and LeFlem, Jean-Paul, *Le Premier Age de l'Etat en Espagne*, CNRS, Paris, 1989.

Hume, Martin, *Spain*, Cambridge University Press, London, 1940.

Jarrow, Robert, "Market Manipulation, Bubbles, Corners, and Short Squeezes," *Journal of Financial and Quantitative Economics*, Vol. 27, No. 3, September, 1992, 311-336.

Kamen, Henry, *The Spanish Inquisition*, Plume, Clinton, Mass, 1965.

Kyle, Albert, S. "Continuous Auctions and Insider Trading," *Econometrica*, 1985, 53, 1315-1335.

__ and Vila, Jean-Luc, "Noisy Trading and Takeovers," *Rand Journal of Economics*, 22, 1, 1991, 54-71

MacDonald, James, *A Free Nation Deep in Debt*, Farrar et. al., New York, 2003.

Madhavan, Ananth; Richardson, Matthew; and Roomans, Mark, "Why Do Security Prices Change?," *The Review of Financial Studies*, Vol. 10, No. 4, Winter, 1997, 1035-64.

Mellor, Alec, *Torture*, Mame, Paris, 1961.

Melvin, Michael and Tan, Kok-Hui, "Foreign Exchange Market Bid-Ask Spreads and the Market Price of Social Unrest," *Oxford Economic Papers*, Vol. 48, No. 2., Apr., 1996, 329-341.

Neal, Larry, The Rise of Financial Capitalism, Cambridge University Press, Cambridge, 1990, 5-19.

Phelps-Brown, E.H. and Hopkins, Sheila, "Wage Rates and Prices: Evidence for Population Pressure in the Sixteenth Century," *Economica*, Vol. XXIV, No. 96, November, 1957.

Saari, D and Simon, C., "Effective Price Mechanisms," *Econometrica,* 53, 5, 1978.

Samuelson, Paul, *Foundations of Economic Analysis*, Cambridge, Mass., Harvard University Press, 1948.

Santos, M. and Woodford, M., "Rational Asset Pricing Bubbles," *Econometrica*, 65, 1, 1997, 19-57.

Scott, William R., *The Constitution and Finance of English Scottish, and Irish Joint-Stock Companies to 1720*, Three Volumes, Peter Smith, Gloucester, Mass., 1968.

Scheinkman, J. and Xiong, W., "Overconfidence and Speculative Bubbles;" *JPE*, 111, 6, 2003, 1183-1219.

Smale, S., "A Convergent Process of Price Adjustment and Global Newton Methods," *Journal of Mathematical Economics*," 3, pp. 107-120.

Smith, Rhea Marsh, *Spain, A Modern History*, University of Michigan Press, Ann Arbor, 1965.

Simmons, Edward, "The Position of the Treasury Bill in the Public Debt," *JPE,* 55, 4, 1947, esp. p 340.

Taylor, George V., "Paris Bourse on the Eve of the Revolution, 1781-1789," *American Historical Review*, Vol. 67, Issue 4, July 1962, 951-977.

Tilly, Charles, *European Revolutions, 1492-1992,* Blackwell, Oxford, 1993.

Theirs, Adolphe, *The Mississippi Bubble: A Memoir of John Law*, Townsend and Co., 1859, esp. 167-89.

Thompson, E., "A Pareto Optimal Group Decision Process," Public Choice, Vol. 1, Fn. 5, 1965, 140.

__ "Debt Instruments in Both Macroeconomic Theory and Capital Theory," *AER*, 57, Dec 1967,1196-1210

__ and Faith, R. "A Pure Theory of Strategic Behavior and Social Institutions," *AER*, June 1981, 366-380.

__and Hickson, C., *Ideology and the Evolution of Vital Institutions*, 2nd Edition, Kluwer, Boston, 2001.

__and Treussard, Jonathan, *The Tulipmania: Fact or Artifact?*, Monograph, UCLA, July, 2004.

Tirole, J, "On the Possibility of Speculation with Rational Expectations,"*Econometrica*, 50, 1982, 1163-82

Tracy, James, *Financial Revolution in the Hapsburg Netherlands*, U. of California Press, Berkeley, 1985.

Young, Alexander, *History of the Netherlands*, Werner, Chicago, 1895.

Woodward, Donald, "The Background to the Statute of Artificers: The Genesis of Labour Policy, 1558-63," *Economic History Review*, Second Series, Vol 33, No. 1, Feb. 1980, 32-44.