

## Chapter 2

### Overall view of speculative markets

“Is the current increase in investment in rare books wholly a good thing? Personally I have reservations. They arise from stories I heard at my father’s knee about the crash in the 1930s: books at that time had been driven up in price far beyond the levels that were truly supported by their significance and their rarity”. These were in 1994 some of the reflections of A. Rother, past president of the International League of Antiquarian Booksellers. The crash that he refers to began in New York after the spectacular fireworks of the Jerome Kern sales in January 1929 and deepened after the stock market crash of October 1929. Values fell so heavily that in 1933 it was customary to pay for Kern copies no more than 10 to 15 percent of what they had fetched at these sales.

The stock market crash has been studied in great detail, but to our best knowledge the crash in the antiquarian book market did not attract much attention. And yet it is in a sense even more revealing of the shift from a state of euphoria to one of dejection. As a matter of fact, if the book market fell it was not just because of the drop in revenue which resulted from the stock market crash, for even fairly cheap books in a price range around 10 dollars were no longer bought and their price plunged. As we will see in a subsequent chapter the fall affected all price segments from books costing less than 10 dollars to books costing more than 1,000 dollars. Thus, studying the book market gives an opportunity to learn how the society reacted.

Curiously, this sort of information has largely been neglected by economists. From the vast literature about speculative bubbles one would draw the conclusion that speculative trading is confined to financial markets. As an illustration of that predilection one can for instance mention Cohen’s book (1997) that we have already cited. Although it considers the question of speculation in a broad historical perspective which makes its reading quite captivating, non-financial markets are almost completely ignored. Even the property

market which has so close connections with financial markets is only briefly mentioned (less than three pages are devoted to it in a total of about four hundreds).

The present chapter provides an overview of several speculative markets. Actually, the expression “speculative market” is probably a pleonasm for any market can give rise to speculative episodes. When we use that expression it rather means that we have statistical evidence of speculative price peaks. At the end of the chapter we also consider stock markets but only shortly since a special chapter will be devoted to them later on.

For each market we restrict ourselves to presenting a number of basic facts; special attention is given to the presentation of statistical sources in the hope of encouraging further studies of these markets. Being more descriptive than analytical, the present chapter is mainly intended for reference purposes; it provides the elements on which subsequent chapters will draw. Accordingly, it can be skipped by well-informed readers or by those who are more interested in analytical results and regularities.

## 1 Overview of speculative markets

In any markets there are at least two kinds of buyers and sellers (i) Those who buy or sell for personal use, subsequently referred to as users. (ii) Investors and speculators who make money by buying and selling with a profit.

Such a distinction is particularly clear in property markets: the users are the residents who live in the houses or apartments they have bought while the investors are property developers, real estate agencies, insurance companies and so on. The proportion of investors in a given market is an important parameter which will be referred to as the *speculative ratio*. The speculative ratio is equal to 1 for stock markets and close to 0 for postage-stamp or coin markets which are dominated by collectors; for property markets it is of the order of 0.2.

In the following paragraphs we try to adopt a uniform presentation for each market: first there is a qualitative description of how the market works; then we discuss statistical sources; thirdly we give one or two instances of speculative episodes; finally, we discuss some of the specificities of the market under consideration.

## 1.1 What kind of price data do we need?

Physicists give great care and attention to the precision and reliability of experimental results. Let us illustrate that point by two examples. (i) If one wants to measure the lift generated by an airfoil one has to make sure that the wind tunnel does not produce too much turbulence. Failing that, observed results can change by a factor 10. (ii) During the development of the meteorological science in the 18th and 19th century one major problem was to make sure that all thermometers and barometers used in various stations were comparable and it was soon realized that the best guaranty was to impose the use of identical instruments (Fierro 1991). Economists, in contrast, devote great attention to modeling but tend to neglect the measurement process. This is unfortunate for flawed observations will spoil theoretical investigations as well.

Depending on the study one is engaged in, the kind of data one needs will be different and in each case one has to make sure that the data are indeed suited to the investigation. In order for instance to study the shape of a price peak annual data are inadequate; one needs higher frequency (i.e. monthly, weekly or even daily) data. If one wants to study the spatial propagation of a price bubble one needs price data for several locations. If the objective is to fit the distribution function of price changes one needs very long records, in order to capture a number of huge but infrequent price peaks.

Table 2.1 summarizes information about existent price records for each of the items considered in this chapter.

The following explanations are in order.

(i) The information given in columns 2-5 is based on sources which will be detailed when we study each market separately (ii) The last column refers to the fact that some items cannot be divided; this is obvious for stamps; it is also true for apartments despite the fact that one can define a price per square meter; the latter indeed will be different for a 5-room apartment or a 1-room apartment. In contrast, if one neglects transaction costs the price of 10,000 shares is just ten times the price of 1,000 shares. For spot markets the discount which is usually granted for large quantities can also be attributed to transaction costs. (iii) On line availability of data files will certainly improve in coming years. Incidentally, the fact that early studies in econophysics concentrated on stock markets was certainly in part due to the fact that extensive stock price records were available on line.

**Table 2.1 Classification of price records**

Item	Price estimate (E) or real price (R)	Price frequency		Prices at several locations		Longest price records	Price range of items
		month-ly or better	highest frequency data [days]	over 10	max. number of locations per country		
Grains	R	Yes	7	Yes	500	420	No
Commodities							
Spot	R	Yes	1	Yes	10	200	No
Futures	R	Yes	<1	No	3	50	No
Stamps	E	No	365	No	1	130	10,000
Books	R	Yes	15	No	3	200	10,000
Land	R,E	No	365	Yes	20	50	10
Property	R,E	Yes	100	Yes	20	30	20
Stocks	R	Yes	<1	Yes	50	130	No

Notes: The table refers to published price records; more detailed records may possibly be available in archives; such is for instance the case for grain prices: before the 20th century grain markets were held two or three times a week and such primary data can be found in archive records. The table is restricted to those items considered in this book which explains the omission of items such as coins, paintings, collectible cars or phone cards. "Commodities" here refers to other commodities than grains.

## 1.2 Grain markets

In Western Europe until the 20th century grains were an essential component in the diet of a majority of the population. In terms of revenue that it generated the production of wheat was the most important single item in national income. At first sight it could seem surprising that such an important commodity was subject to heavy speculative trading. Among the factors which favored speculation the following probably played a key role: (i) During times of scarcity prices could be multiplied by three or four. For all people whose revenue was high enough a natural reaction was to buy grain reserves before the price was too high; this is well documented by contemporary reports, see for instance Biollay (1885), Modeste (1862), or Martin (1908); for instance a survey conducted by the French government described how people bought up the wheat market at the first signs of a coming wave of high prices and stored large amounts of wheat for future use (Biollay 1885). (ii) For those people who by their function had to buy and collect large quantities of wheat, for instance traders in charge of provisioning the army, it was very tempting to speculate either for the benefit of their administration or their personal profit. Such practices are documented in Bord (1887) and Martin (1908). Moreover the large number of laws and regulations aimed at prohibiting specific forms of speculation attest that such business practices were fairly common, see in this respect Abeille (1764) or Herbert (1755); moreover several authors (e.g. Martin 1908) point out that the existing regulation was not always enforced.

### 1.2.1 Organization of the market

Lawfully, grains had to be sold only on the market-sales that took place once or twice a week in most cities and towns; in such a way everybody was given the same chance to buy which is the way an efficient market is supposed to operate; present-day regulation about inside information has the same objective. Nevertheless large quantities of wheat were often sneaked from the producers directly to traders thus bypassing the market-sales. While small traders, the so-called “blatiers”, fulfilled a useful role in the distribution of grains, in times of dearth numerous self-proclaimed “blatiers” attracted by the expectation of huge profits entered the trade, a circumstance which amplified the speculative frenzy.

In the era before 1850 grain prices very much played the same role as stock prices nowadays in shaping the spirits of a population, a parallel which is summarized in Table 2.2a.

At first sight it is not completely obvious that high wheat prices should have

**Table 2.2a Parallel between wheat and stock markets**

Yesterday	Nowadays
Wheat prices	Stock prices
Low and declining	High and increasing
↓	↓
High spirits	High spirits
High birth/marriage rate	High birth/marriage rate
High and increasing	Low and declining
↓	↓
Low spirits	Low spirits
Low birth/marriage rate	Low birth/marriage rate

Notes: The correlation between population fluctuations (i.e. birth/marriage rates) and wheat or stock prices was pointed out in Roehner (1995, chapter 5).

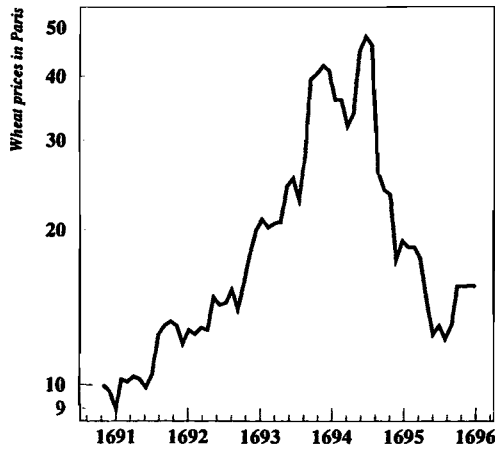
been associated with a contracting economy for wheat producers and traders may have profited from the price increase, especially if one accepts the standard argument about the so-called King's law<sup>1</sup>. However, it has been shown that high wheat prices lead to a fall in marriage and birth rates (Roehner 1990, 1995); on the contrary marriages and births increased in times of low prices which reveals a more euphoric social climate. A similar phenomenon occurred in the early 1930s: the depression which followed the stock market crash lead to a sharp decline in the American birth rate; the latter dropped from an average 2.45 percent in the decade 1921-1930 to an average 1.90 percent in the decade 1931-1940. Moreover, it will be shown in a latter chapter that in the late 1990s consumer confidence was strongly correlated with stock price levels.

### 1.2.2 Price peaks

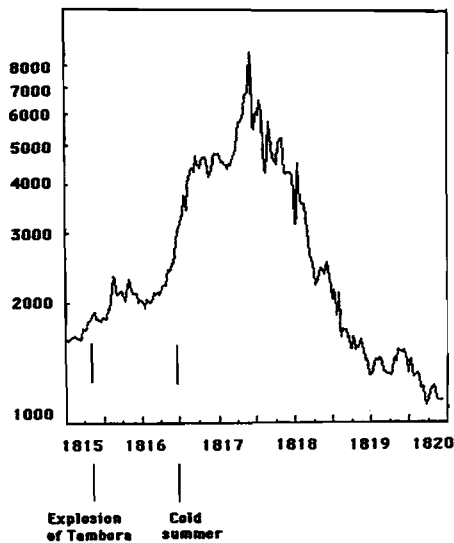
Fig.2.1a,b show two price peaks which can be considered as fairly typical. One is for Paris in the late 17th century, the other is for Munich in the early 19th century.

These peaks share several common features: (i) The total duration of the peak is about 5 years. (ii) The amplitude of the peak that is to say the ratio  $p_2/p_1$

<sup>1</sup>It states that the price increase is proportionally larger than the fall in production which means that the revenue received by producers was increased in times of scarcity.



**Fig.2.1 a Monthly wheat price in Paris (1691-1694).** Vertical scale (logarithmic): livres tournois per setier (1 setier=1.56 hectoliter). Grain markets were held twice a week; the highest figure was reached on 19 May 1694 with a price of 52 livres/setier. *Source: Baulant and Meuvret (1960).*



**Fig.2.1 b Wheat price in Munich (1815-1820).** Vertical scale (logarithmic): 1/100 gulden per Schäffel (1 Schäffel=2.2 hectoliter). If one excludes the potato famine in Ireland in the 1840s this was the last large-scale dearth in Western Europe. It may be of anecdotal interest to note that the peak was probably triggered by the bad harvest of the year 1816 referred to as the “year without summer”; that meteorological anomaly may have been caused by the explosion of Mount Tambora (5 April 1815), a volcano located in Indonesia which ejected some 40 cubic kilometers of debris in the high atmosphere. *Sources: Seuffert (1857), Stommel et al. (1979).*

of the peak price to the initial price is about 5. (iii) Although the two curves differ in their details, their overall shape is similar: both the upgoing and the downgoing paths have the shape of a function of the form  $y = x^\alpha$  ( $\alpha > 1$ ). Since the vertical scale is logarithmic this means that the growth is faster than an exponential. This property is common to most wheat price peaks. It is precisely this similarity which leads to the conclusion that there must be a common mechanism. At the start of the peak there is usually an exogenous factor, but once started the bubble seems to have its own dynamics.

### 1.2.3 Sources

Thanks to the efforts of several generations of economic historians many long price records have been published in book form. As a result it is easier to find data about wheat prices in the 17th century than about property prices in the 19th (or even 20th) century. Some major sources are listed in Table 2.2b.

## 1.3 Commodities

The price behavior of commodities is a vast subject. In this paragraph we restrict ourselves to a few basic facts.

### 1.3.1 Organization of the markets

The price quotations given in financial newspapers are restricted to major exchanges; the Financial Times will report prices from the Metal Exchange and Baltic Exchange both located in London, the Wall Street Journal will give the prices at the New York Mercantile Exchange and the Chicago Board of Trade. This could lead the reader to the conclusion that for each commodity there are only two or three meaningful marketplaces. This would be an oversimplified view however; let us briefly explain why.

On commodity exchanges most transactions concern futures. As one knows, a forward contract gives the buyer the right to take delivery of a given, standardized quantity of a given commodity in 3, 6 or 9 months. Actually only a very small proportion (less than five percent) of the transactions on futures markets eventually result in the delivery of physical quantities. Because contracts can be transferred from one market to another (at least if similar contracts exist on both markets) one would expect arbitrage between futures markets to be similar to arbitrage between stock markets, that is to say almost instantaneous and performed with negligible transaction costs. This is indeed confirmed by empirical observation (see Roehner 2000a, p.180). On



**Table 2.2b A selection of wheat price sources**

Characteristics	References
Long records (over 100 years)	Ebeling et al. (256 years), Baulant et al. (178 years), Drame et al. (428 years)
High frequency (better than weekly)	American cash grain prices (1 day), Baulant et al. (2 days), Seuffert (7 days)
Many locations (intermarket distance < 100 km)	Drame et al. (53 markets), Labrousse et al. (85 locations), Seuffert (12 markets)
High frequency (better than monthly) <i>and</i> several locations	Drame et al. (14 days, 53 markets), American cash grain markets (1 day, 8 markets)

Notes: As in meteorology a major objective is to have good coverage both in time (high frequency data) and in space (many locations). This table reports only market prices. Some series such as the very long Exeter price record (1316-1820) whose prices come from accounting books of hospitals or monasteries are therefore not included; such series usually have a smaller price volatility than market prices. The daily American cash grain prices though not published in book form can be obtained from the United States Department of Agriculture. Other references for historical price series can be found in Drame et al. (1991) and Grenier (1985).

spot markets, on the contrary, commodities are traded for immediate delivery; thus spatial arbitrage on spot markets requires actual transportation of physical quantities from one point to another. As a result there are usually substantial differences, of the order of 15 percent, between prices of a given commodity on geographically separated spot markets. This is true for international markets (see for instance the prices listed in the UNCTAD Monthly Commodity Price Bulletin) as well as for markets located in the same country, e.g. Middle West versus West Coast wheat markets (Roehner 2000a, p.177).

### 1.3.2 Price peaks

Fig.2.2 a,b,c,d show four cases characterized by increasing volatility (i.e. standard deviation of prices). In order to facilitate the comparison the graphs were drawn with the same vertical scale. Note that relative levels of volatility

would be the same in the longer period 1900-1960 (see Roehner 1995, p.12-14).

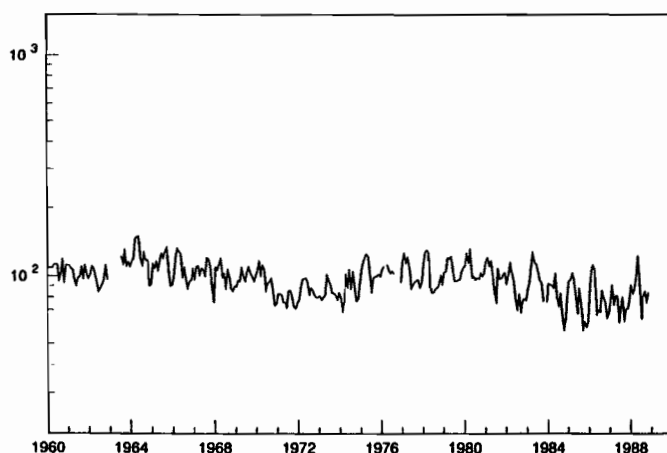
Explaining why these markets have these volatilities is probably a difficult problem; for a theoretical attempt based on storage costs see for instance Deaton et al. (1992.). One major difficulty is the fact that the volatility depends not only upon the organization of the market but also upon the intensity of exogenous shocks. Fig.2.3 lists some possible causes of price fluctuations. One simple observation can be made: since the volatility of banana prices is almost zero once seasonal fluctuations are discounted this means that both A and B factors are absent. The second conclusion is of particular interest; as a matter of fact the three speculative strategies listed in Fig.2.3 (endogenous dynamics) suppose that the commodity under consideration can be stored for a sufficiently long time and at fairly low cost. If, as is the case for bananas, no storage is possible then the B factors disappear as a source of volatility. This analysis is confirmed by the fact that most speculative bubbles that we discuss in subsequent chapters concern goods which can be easily stored: gold, diamonds, stamps, books, and to some extent land and property are some examples. Moreover for all these markets the inventories held by the public exceeds the volume of annual transactions. In short, one is lead to posit that the existence of a floating stock-pile conditions speculation. If that assumption is correct one would for instance not expect a marked speculative dynamics for electricity prices. It will be possible to test that prediction in a few years when the deregulated electricity market which is progressively taking shape in Western Europe will be functioning.

### 1.3.3 Sources

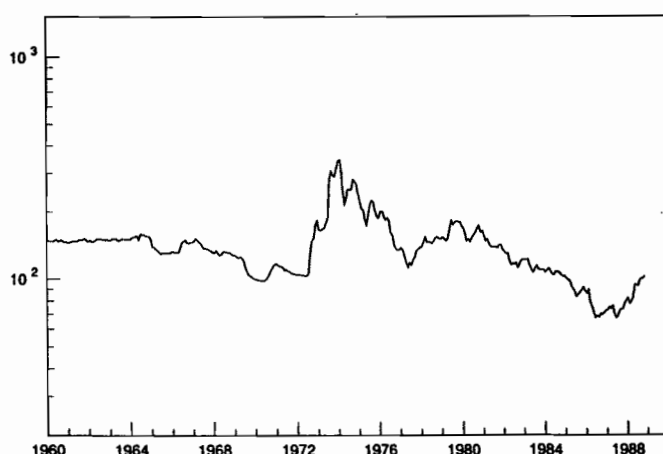
The two following sources are important because they give monthly prices for all major commodities (i) The Monthly Commodity Price Bulletin published by UNCTAD (United Nations Conference on Trade and Development). (ii) The International Financial Statistics published by the International Monetary Fund. For data concerning a specific commodity the relevant sources can be found in commodity guides (e.g. Radetzki 1990 or Cyclope) or on the computer Web.

## 1.4 Land and property

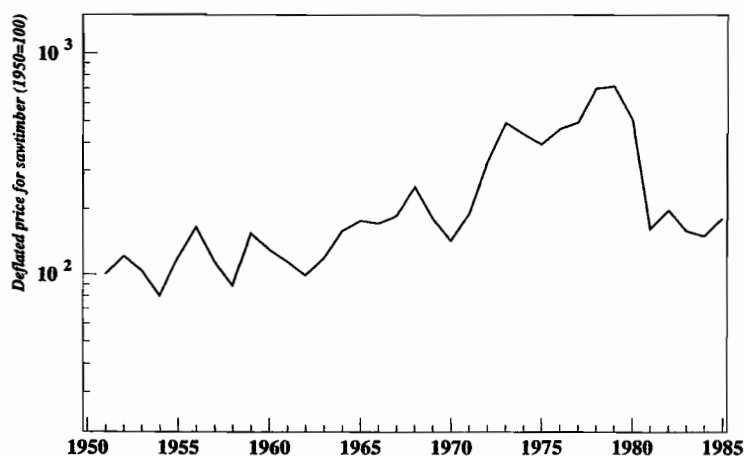
Land and property assets represent considerable amounts. The extreme case of 1990 Japan is well known. At that time, Japan's total stock of property was valued at about three times the capitalization of the Tokyo stock market or five



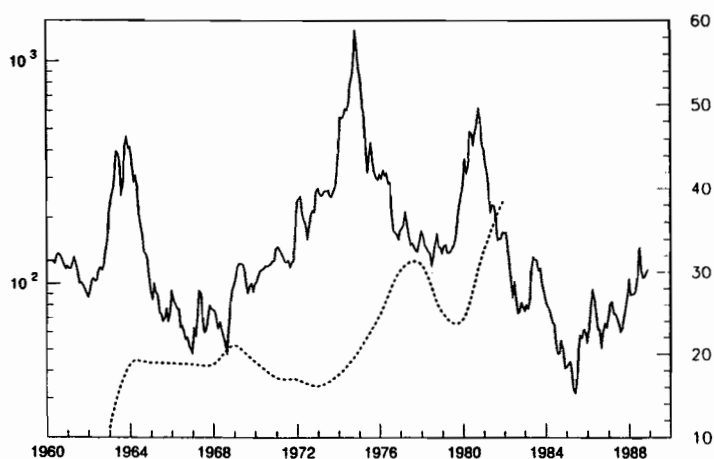
**Fig.2.2 a Price of bananas.** The data are monthly prices for Central America bananas expressed in US cents per pound and deflated by the US consumer price index. Apart from seasonal fluctuations the price remains almost constant. The figures 2.2a,b,c,d are drawn with the same vertical scale in order to facilitate a comparison of price variability. The fact that there are no price peaks for bananas can probably be related to the distinctive fact that they cannot be stored for more than a few weeks. Their production and distribution on the American continent is in the hands of a small number of firms: United Brands, Castle and Cooke, Del Monte. *Sources: UNCTAD Monthly Commodity Price Bulletin 1960-1984, 1970-1989.*



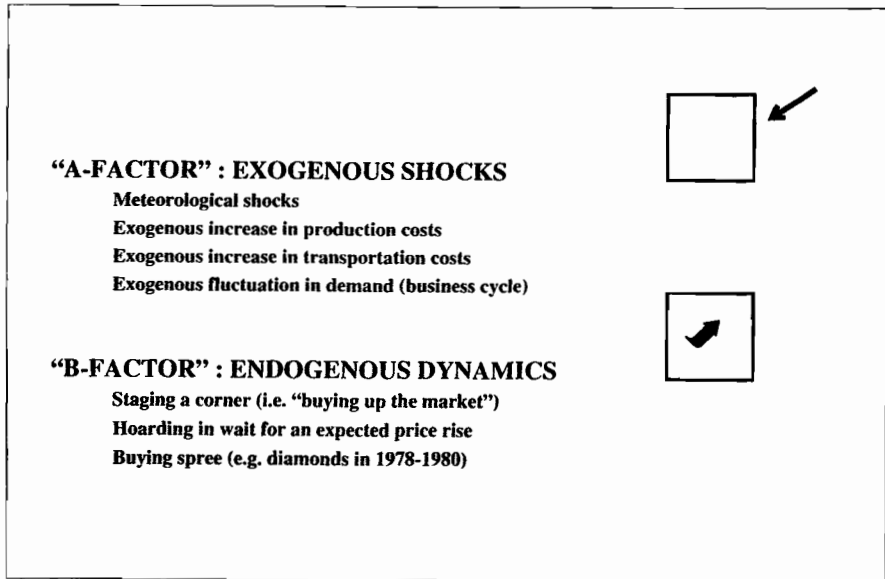
**Fig.2.2 b Price of wheat.** The data are monthly prices for American wheat (Hard Red Winter) in Gulf of Mexico ports expressed in US dollars per ton and deflated by the US consumer price index. *Sources: same as Fig.2.2a.*



**Fig.2.2 c Price of Douglas-fir sawtimber.** The data are annual prices on national forests in Oregon and Washington states; they are expressed in dollar per thousand board feet and are deflated by the US consumer price index. Between 1970 and 1980, according to the industry, there was a bubble which resulted in a multiplication of the real price by a factor 4. This is all the more surprising because the market is largely under the control of the Federal government through the Bureau of Land Management and the U.S. Forest Service. This price peak parallels similar peaks observed at about the same time for diamond, gold, silver, platinum. *Source: Matthey (1990).*



**Fig.2.2 d Price of sugar.** The data are monthly prices observed in Caribbean ports expressed in US cents per pound and deflated by the US consumer price index. The course of sugar prices displays a number of huge peaks of an amplitude comprised between 5 and 10 and a duration comprised between 3 and 6 years. The broken line shows the evolution of world closing stocks. It can be noted that the 1975 peak does not coincide with a sharp drop in closing stock levels. *Sources: UNCTAD Monthly Commodity Price Bulletin 1960-1984, 1970-1989; McGraw Hill handbook of commodities trend futures (1985).*



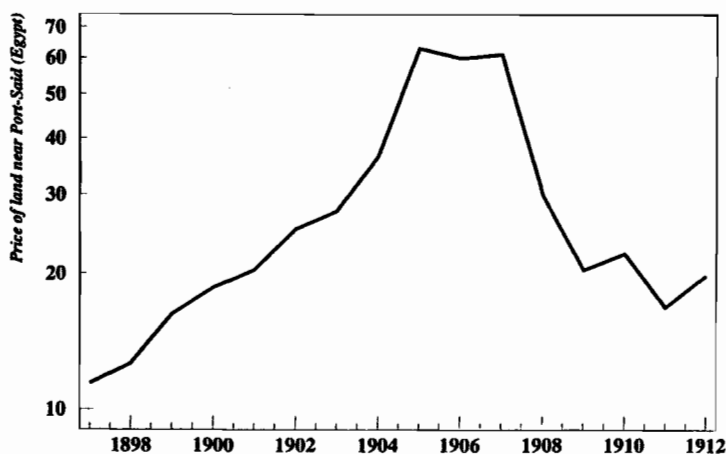
**Fig.2.3** Some factors which may trigger large fluctuations in the price of a commodity. Exogenous means here that the shock originated outside the market of the commodity under consideration; for instance a recession will reduce the level of demand for a large variety of other goods. On the contrary, the endogenous shocks originate within the market itself either at producer, trader or consumer level.

times the size of Japan's gross national product (Wood 1992). Land speculation also played an important role in the expansion of the United States toward the West (see in this respect Swierenga 1968). Unfortunately economists and statisticians have given little attention to land and property markets which explains the scarcity of statistical information on that matter.

#### 1.4.1 Examples

Fig.2.4a gives an example of land speculation in the area of Port Said (Egypt). That city is located at the entrance of the Suez canal which was inaugurated in 1869.

The Port Said land speculation is typical of a mechanism recurrently observed in the 20th century; for instance in the Tokyo area in the 1980s, or in Hong Kong and Singapore in the 1990s. In all these cases land speculation was accompanied by a rise in stock prices, and both markets crashed simultaneously. Fig.2.4b illustrates the property speculation in Singapore and Hong Kong. In



**Fig. 2.4a Price of land in Egypt.** Vertical scale: average price per square meter expressed in French francs; the data refer to sales made by the company of the Suez canal in the vicinity of Port-Said. The abrupt decline that occurred after 1907 accompanied a stock market crash in Alexandria: between April 1907 and February 1913 stock prices of real estate companies dropped by about 50 percent. In a sense this episode paralleled, though on a much smaller scale, the 1990 stock and property crashes in Japan. *Source: Bourgeois (1913).*

Singapore the government tried to curb real estate speculation by restricting property loans; subsequently, in mid-1997, both in Hong Kong and Singapore the market fell sharply in the wake of the stock market crash.

### 1.4.2 Sources

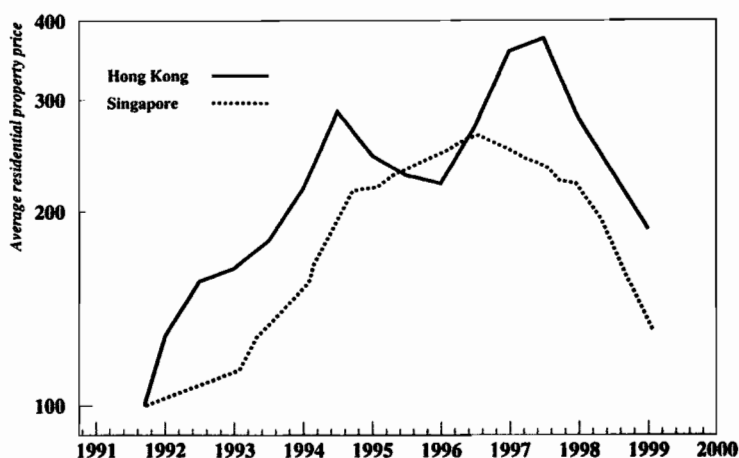
Price series are scattered in various publications issued by real estate companies and government agencies. Let us mention some of them.

(i) In the UK the Halifax house price series exists since 1983 and trading volumes are available since 1989. Figures for recent years are accessible on line at the following addresses:

<http://www.houseweb.co.uk> and <http://www.halifaxplc.com>

(ii) For Paris, starting in 1985 price and volume series for old apartments (i.e. apartments which have already been sold at least once) are published by the *Chambre des Notaires* (lawyers syndicate). Furthermore, data, graphs and comments can be found in the journal “*Conseil par des notaires*” (Advice from lawyers)

(iii) In Hong Kong property price data are published by the Rating and Valuation Department of the Hong Kong government. The series for the past five



**Fig.2.4 b Average price of residential property in Hong Kong and Singapore.** The prices are expressed in (non-deflated) local currency. The index 100 corresponds to a price of 2730 US dollar per square meter for Hong Kong and 2290 US dollar per square meter for Singapore. In May 1996 the government of Singapore took severe measures to limit speculation which is probably why the Singapore market began to plummet before the Hong Kong market. The latter dropped in the wake of the 1997 stock market crash. It should be noted that the overall shape of the curves in Fig.2.4a and b are similar, both are characterized by a downward concavity and a round top. Such a pattern strikingly contrasts with the one for commodities shown in Fig.2.1a,b. Sources: Hong Kong: *Financial Times* (27 March 1997), *Guardian* (16 Jan. 1998), *Agence France Presse* (20 Oct. 1999), on-line site of the Rating and Valuation Department of the Hong Kong government. Singapore: *Agence France Presse* (various dates).

years are available on line at <http://www.infogov.hk.rvd>

(iv) For Japan land prices by prefecture are published in the “Japan statistical yearbook”.

At this point a word of caution is in order regarding the comparability of real estate series. First, one must distinguish between real price averages and estimates made by experts; the first three series belong to the first category while the fourth belongs to the second. As a rule estimates made by experts tend to lag behind real prices and tend to underestimate the amplitude of price peaks. Furthermore price averages can be performed in a number of different ways. Thus, the index issued by the Hong Kong Rating and Valuation Department is a weighted average based on various size and luxury factors, the details of which are unfortunately not given.

## 1.5 Postage stamps

Postage stamps are an item which in many ways is of great interest for the study of speculative bubbles.

### 1.5.1 A useful “laboratory” for studying speculative trading

The main advantage of the stamp market is that it is “simpler” than other speculative markets. Let us briefly explain why. (i) The stamp market is relatively isolated from other speculative markets because the proportion of collectors is by far larger than the proportion of investors. Moreover, if one excepts a small number of particularly rare stamps, most of them are fairly inexpensive compared with an apartment or a futures contract and can therefore be bought even in times of recession. (ii) For stamps “production” and “consumption” take on particularly simple forms. Production is restricted to a short time span when the stamps are on sale in post offices; moreover production figures, that is to say the total number of stamps sold, are well documented in stamps catalogs. Since most collector’s stamps are not used on letters, consumption occurs only by wear and tear or by loss (for instance after the death of a collector). It is therefore not unrealistic to assume that consumption takes place at a slow, and fairly constant rate. (iii) A few decades after they have been issued, stamps can no longer be used on letters. Moreover in contrast to gold or silver coins, stamps cannot be melted. Thus, having no “intrinsic” value, their price is solely determined by the judgment of collectors. (iv) In contrast to other collectibles such as paintings or furniture, stamps can easily be stored and are fairly liquid assets. Any valuable stamp can be sold to a trader at a price indexed on the catalog price, the difference being determined by the state of conservation of the stamp. (v) The stamp market displays huge price bubbles. Multiplication of the current price by a factor of about ten within one decade is not uncommon. (vi) Stamp prices range from a fraction of a dollar to several thousand dollars for very rare stamps. This gives the unique opportunity to observe the speculative behavior of collectors when the amount at stake varies over a broad interval.

In short, the stamp market constitutes an excellent laboratory for studying speculative trading. To be fair, one must recognize that there are also a few drawbacks especially regarding statistical information. For one thing, stamp catalogs are published only every year, and in some cases for instance for foreign stamps only every two or three years. This precludes any investigation of short-term price fluctuations. Secondly, prices given in the catalogs are not “real” prices but price estimates made by experts. Thirdly, since the bulk of



the transactions take place between private individuals and are therefore not recorded, it is impossible to estimate the trading volume.

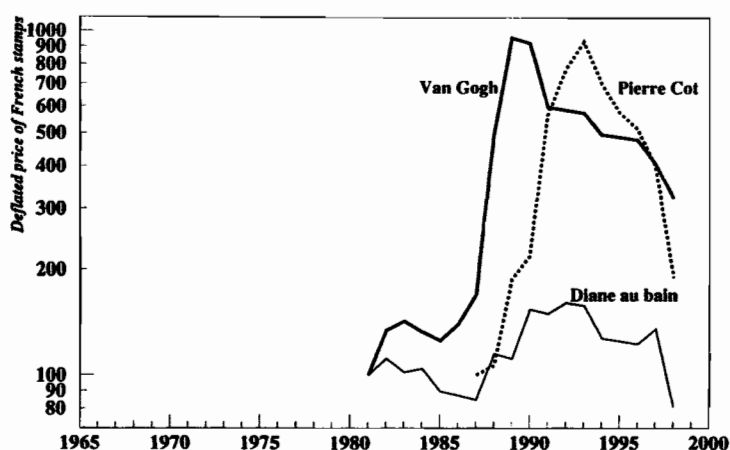
### 1.5.2 Price peaks

Fig.2.5a,b give examples of two huge price peaks. It is worth pointing out that the “Van Gogh” and “Diane au Bain” stamps had the same face value (2 French francs), were put on sale the same day (27 Oct. 1979), with same number of copies (6 millions). Yet, only the first became a speculative target. This provides a clear example of the fact that often there are few objective causes at the origin of a speculative process. One may in fact wonder whether such peaks do not reflect deliberate attempts to corner the market, i.e. to take control of the market by buying up all available stamps. Let us examine that point further.

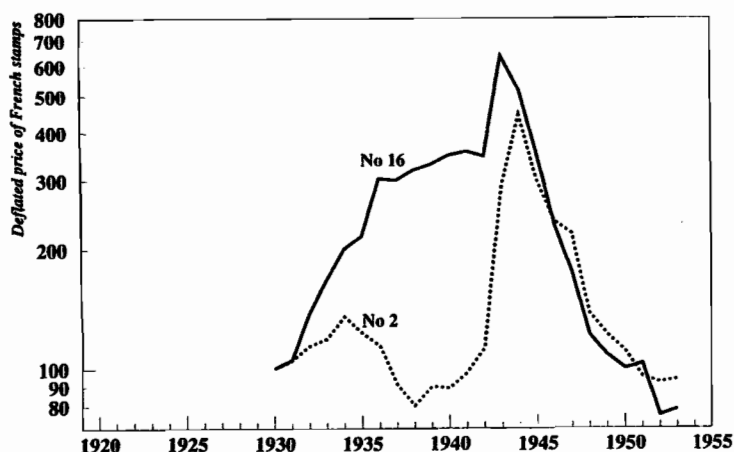
When they were issued the 6 million Van Gogh stamps were worth  $2 \times 6 = 12$  million French francs, an amount which represented only 4 percent of the annual turnover of the five major French trading houses. In other words, a trader or a rich collector could possibly take control of a sizeable portion of the total stock. Which proportion of the stock (10, 40 or 75 percent?) has in fact to be controlled in order to push the price to such high levels is a question of some interest; let us for the moment assume that the proportion is 75 percent. At the highest point of the peak the Van Gogh stamps were worth 60 francs and 75 percent of the total stock represented about 60 percent of the trade over of the major trading houses. One should keep in mind that there are at least 1,000 commonly traded French stamps and it would be unrealistic to think that the traders would commit 60 percent of their purchasing power to just one stamp. This discussion shows that if this was indeed a corner then it must be possible to take control of the market by buying a proportion of the total stock much smaller than the level of 75 percent that we assumed.

### 1.5.3 Sources

The basic sources for stamp prices are the stamp catalogs. In most western countries stamp catalogs have been published annually for more than a century. Thus, for 19th century stamps long price records are available. However, as we already mentioned, there are no high frequency data. Another practical difficulty is the fact that stamps catalogs are usually not to be found in university libraries. One has to resort to specialized libraries such as for example in France the Musée de la Poste (Mail museum, 34 Boulevard Vaugirard, Paris). Table 2.3 summarizes some references of stamp catalogs.



**Fig.2.5 a Speculative peak for two French stamps.** The “Van Gogh” and the “Diane au bain” stamps were issued the same day and in very similar conditions (same face value, same number of copies); yet, in contrast to the first the second did not become a target for speculation. *Source: Cérès catalogs 1980-1998.*



**Fig.2.5 b Speculative peak for French stamps during World War II.** During the war consumption was drastically curtailed and there was a substantial rate of inflation, it is therefore not surprising that available revenue was spent on such items as stamps or antiquarian books (see Fig.2.6). For the purpose of comparison the horizontal scale is similar in Fig.2.5 a and b. *Source: Massacrier (1978).*

**Table 2.3 Stamp price sources**

Sources	Countries covered
American catalog: Scott (Sidney, Ohio, since 1863)	US, Canada, UK, Commonwealth
British catalog: Stanley Gibbon (since 1898)	UK, Commonwealth
French sources:	
(i) Cérès catalog (since 1942)	France
(ii) Yvert et Tellier catalog (since 1898)	World
(iii) Massacrier (1978)	19th century French stamps
Notes: Massacrier gives price series for all 19th century French stamps from 1904 to 1975.	

## 1.6 Antiquarian books

This paragraph is devoted to the market of antiquarian books; these are also sometimes referred to as rare books but we will avoid that expression because it can be misleading by suggesting that all these books are indeed rare and hence expensive, which is not the case. As a matter of fact, the price range of antiquarian books extends from a few euros to several thousand euros. How is this market organized and why it is of interest for our purpose?

### 1.6.1 Organization of the market

A distinctive feature of the book market is that auction sales represent a large proportion of total sales. For instance in France in the 1990s it is estimated that auction sales represented one half of the sales, the other half being sales in antiquarian bookstores; there were about 100 auction sales a year, each with about 300 lots of books sold. Because auction sales are a key element of the market, sale prices were recorded and published yearly in book form. That usage has been followed for over a century in countries which had a major book market, e.g. Britain, France, Germany or the United States. While for stamps we had to satisfy ourselves with estimates, for books on the contrary one has access to actual sale prices.

Unfortunately, there is a feature of the book market which raises a serious difficulty. We already mentioned that for stamps the state of conservation is an important element in the determination of the price. For books, that question is even more crucial to the point that each book is almost unique. Let us explain why. As for stamps state of conservation and quality of the binding are of course important factors, but this is only part of the problem. A given title is usually available in different editions and within each edition in successive printings; the number of copies printed in each printing is a key element of the book's rarity and therefore of its price. As an example, a 1831 edition (Gosselin, Paris) of "Notre Dame de Paris" by the French writer Victor Hugo is available in four successive printings; for some reason the name of the author and of the publisher was omitted on the copies of the first printing and as a result these copies are priced three times as much as the three other printings (Clouzot 1996). Similarly a dedication on the front page of a book can inflate its price substantially. For all these reasons one can never be sure that two books are identical. What complicates the matter even more is the fact that the short descriptions of the books which are given in auction catalogs are written by experts who may change in the course of time; thus the very same book appearing in two separate sales can well be described in different terms.

### 1.6.2 Price peaks

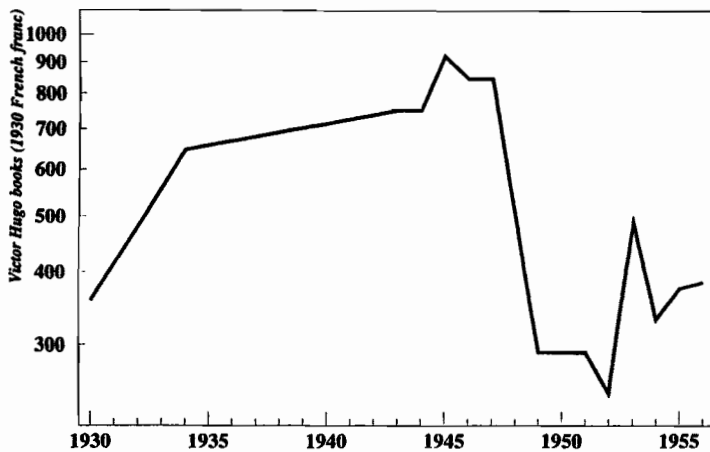
Fig.2.6 gives an example of a price peak for books which parallels the peak of Fig.2.5 observed in the same period for stamps. Unfortunately, since no sale records were published in the years between 1934 and 1942 it is somewhat difficult to identify the beginning of the peak. Other examples of price peaks will be given in subsequent chapters.

### 1.6.3 Sources

Table 2.4 summarizes the sources in different countries. In recent years all catalogs have become international in the sense that for instance an American catalog will also report sales in Geneva, London or Paris.

## 1.7 Diamonds

For an economist the diamond market constitutes a very interesting case for it is an example of an almost perfect monopoly; while oligopolies are not uncommon real monopolies are rare. De Beers's, the South African mining



**Fig.2.6 Speculation peak for books.** Vertical scale: average price of books by Victor Hugo sold at auction sales and deflated by the consumer price index. The factors which lead to the stamp bubble, and particularly the high inflation rate probably also account for the book bubble. Sources: Sales catalogs: Delteil, Brecourt, Grolier (various years).

group, has been in control of the diamond market for over a century; in 1999 it controlled two-thirds of world gem diamond sales.

### 1.7.1 Organization of the market

It may be tempting to explain the absence (or the existence) of large speculative peaks in a given market by the fact that it is dominated by one company. The case of diamonds clearly shows that such explanations cannot be sufficient. Indeed, although in “normal” times the diamond market is fairly stable, it was marked by two huge peaks which culminated in 1929 and 1980 respectively. The 1980 peak is shown in Fig.2.7. Hence De Beer’s claim that through its control of the market it is able to stabilize prices is not entirely true.

De Beer’s monopoly has other consequences as well: (i) Diamond prices are not made public, a rule which, although seldom stated explicitly, is accepted by most people in the industry. (ii) De Beer’s was indicted in 1994 by the U.S. Justice Department on charge of fixing industrial diamond prices and this was but a new episode in the four-decade long attempt of the American government to break up De Beer’s monopoly. De Beer’s answer was to withdraw from the U.S. market but the group continues to sell diamonds to American

**Table 2.4 Book price sources**

Country	Reference
Britain	Book-prices current. A record of prices at which books have been sold at auction. Sergeants Press. London.
France	(i) Delteil (L.) 1920-1930: Annuaire des ventes de livres. Delteil. Paris. (ii) Brecourt 1934: Liste alphabétique et prix des livres adjugés à l'hôtel des ventes de Paris d'octobre 1933 à juin 1934. Brecourt. Paris. (iii) Grolier (E. de) 1945: Le guide du bibliophile et du libraire. Rombaldi. Paris. (iv) L'argus du livre ancien et moderne. Répertoire bibliographique. Editions Promodis.
Germany	Jahrbuch der Auktionenpreise für Bücher. Ernst Hauswedell. Stuttgart.
United States	American book-prices current (since 1894): E.P. Dutton. New York ; and other publishers subsequently.

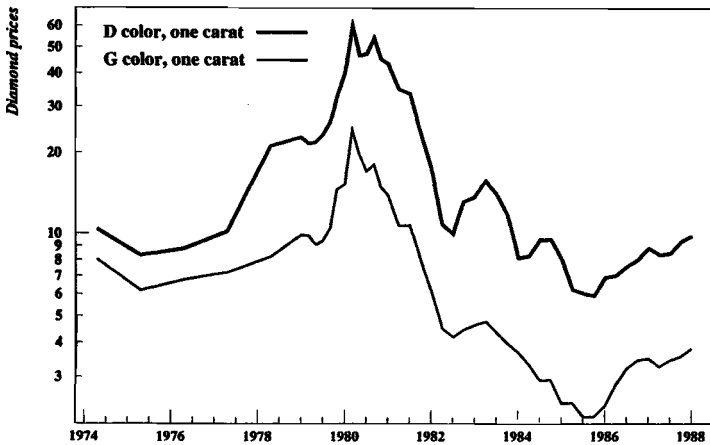
dealers through its London trading house (Epstein 1982, Financial Times 31 Jan. 2000).

### 1.7.2 Diamond prices

From the few price data available it is possible to derive a useful relationship between the weight of a diamond expressed in carats (1 carat=0.2 gram) and its price, namely:

$$\text{price} = K \text{mass}^{\alpha} \quad \alpha \simeq 2$$

where  $K$  is a coefficient which depends on the currency unit used. That rule can be derived by regression from the data in table 2.5. The interesting point is the fact that it fits data from the 18th as well as 20th century. It seems therefore to be a very robust regularity in the diamond industry. Since diamond prices are so difficult to obtain the above formula provides a means for deriving prices for diamonds of different sizes from a single figure.



**Fig.2.7 Speculation peaks for diamonds in the late 1970s.** Vertical scale: thousand of 1980 dollars. In the diamond color classification D denotes the highest quality (white); from D the classification extends down to Z. One should bear in mind that the diamond bubble was not an isolated phenomenon; the factors which affected the price of diamonds also affected the price of cobalt, gold, palladium, platinum and silver. Source: *Diamond 1988 (The Economist, Special Report No 1126)*.

## 1.8 Other speculative markets

There are many other speculative markets for instance for coins, wines, paintings or furniture. We restrict ourselves to giving some basic references (Table 2.6) where the interested reader will find more details about the organization of the market and price sources.

## 1.9 Stock markets

Stock markets have come to play an ever increasing role in modern economies. Because they constitute a fascinating example of speculative market they have been studied with much attention by financial analysts and more recently by econophysicists. In this respect one should mention the following important contributions: Bak (1996), Bak et al. (1997), Bouchaud et al. (1997, 2000), Caldarelli et al. (1997), Farmer (2000), Levy et al. (2000), Lux (1995), Lux et al. (1999), Mandelbrot (1997), Mantegna (1991, 1999), Mantegna et al. (1995, 1999), Marsili et al. (2000), Shatner et al. (2000), Sornette et al. (1996), Stauffer et al. (1999), Zhang (1998). Stock markets however constitute systems of great complexity and a real understanding has not

**Table 2.5 Relationship between the weight of a diamond and its price**

1720				1997	
Weight ( <i>m</i> )	Price ( <i>p</i> )	Weight ( <i>m</i> )	Price ( <i>p</i> )	Weight ( <i>m</i> )	Price ( <i>p</i> )
[grain]	[livres]	[grain]	[livres]	[carat]	[dollar]
1	13.5	11	1,300	0.5	4,000
1.5	24.5	12	1,550	1	16,000
2	38	13	1,900	2	52,000
2.5	61	14	2,250	3	120,000
3	68	15	2,750	5	275,000
3.5	100	16	3,300		
4	109	17	3,600		
4.5	150	18	4,000		
5	205	19	4,750		
5.5	225	24	6,000		
6	315	30	10,250		
7	420	35	17,500		
8	580	40	22,500		
9	800	45	35,000		
10	1,000	50	55,000		
		60	67,000		

Notes: The 1720 data are for Holland-style cut diamonds; the 1997 prices are for D-IF (D=white, IF=Internally Flawless) diamonds which correspond to the highest quality. These figures are based on expert estimates rather than on actual sale prices.

A regression performed on the logarithms leads to a relationship of the form:

$p = Km^\alpha$  with:  $\alpha_1 = 2.17 \pm 0.07$  ( $r=0.99$ ) for the 1720 data, and  $\alpha_2 = 1.84 \pm 0.07$  ( $r=0.99$ ) for the 1997 data. In other words:  $p = Km^2$  is a reasonable approximation; it means that the price per carat is in proportion to the size of the diamond.

A grain corresponds to 0.064 gramme and a carat to 0.2 gramme, which implies that 1 carat=3.13 grains. The largest known diamonds weight about 100 carats. As an illustration the so-called "Grand Sancy" diamond (55 carats) was sold in 1600 for 210,000 livres and in 1604 for 180,000 livres which corresponds to 1220 livres/grain and 1046 livre/grain respectively (Quid p.546), two figures which are consistent with the previous relationship which gives a price of 1116 livres/grain.

Sources: 1720 data: *Savary des Bruslons* (1723); 1997 data: *Rapaport Diamond Report* (statistical section) 10 Ja. 1997.



**Table 2.6 Sources for coin, painting and wine prices**

Item	References
Coins	World Coins (periodical) Montroll et al. (1974, p.200-205)
Paintings	Buelens et al. (1993), Pommerehne et al. (1989)
Wine	Di Vittorio et al. (1996)

Note: Here is an example of a speculative episode for the coin market. In the late 1970s and early 1980s investors flooded into the coin market pushing coin prices to historic highs and forcing out traditional collectors who felt coins had become overvalued. As soon as the newcomers discovered how difficult it was to sell their coins they fled pulling down prices by around 30 percent (Herald Tribune 28 May 1995).

yet been achieved. One of the major themes of this book is precisely that by studying other, in many respect simpler, speculative markets we are in a better position to understand the basic mechanisms of speculative trading. This does not mean however that stock markets are excluded from our study, rather they are considered in the broader context of speculative behavior.

In this paragraph we present a brief historical survey and we explain the organization of the market. For stock markets there are plentiful sources of statistical data, therefore we did not devote a special paragraph to this question; Table 2.7 only lists a number of historical sources and periodicals.

### **1.9.1 Role of stock markets: an efficient capital allocation machine**

The purpose and usefulness of the markets considered in the previous paragraphs were fairly obvious. For instance the stamp market enables collectors to improve and update their collection. What purpose is served by holding stamps is of course another question that we do not consider here. The economic role of a stock market is perhaps less obvious. Standard textbooks tell us that one of its main purpose is to enable companies to raise money. Let us consider that question more closely from a system theory point of view.

There are basically four ways for a company to raise money. (i) To borrow

**Table 2.7 Sources for stock market data****Series beginning before World War II**

The Commercial and Financial Chronicle (periodical, New York)

The Dow Jones averages 1885-1970, M.L. Farrel ed. Dow Jones Books (1972)

Common Stock price histories 1910-1987, D.E. Prendeville ed.(1987) and logarithmic supplement (1988). WIT Financial Publishers.

**Series beginning after World War II**

Vigreux (P.), Pistre (M.) 1967: *Dynamique du marché financier*. Editions d'Organisation Paris

World Stock Exchange Fact Book (periodical starting in 1995)

New York Stock Exchange Fact Book (periodical)

London Stock Exchange Fact Book (periodical)

Toronto Stock Exchange: annual report and fact book (periodical)

Emerging Stock Markets Factbook (periodical starting in 1997)

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Notes: After 1995 a large number of on line sites came into existence which provide stock market prices; moreover extensive data sets can be purchased in CD-ROM form from various companies.

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from a bank (ii) To sell stocks (iii) To sell corporate bonds (iv) To use its own cash-flow.

The two last methods can hardly be used by those small new companies which are so important in high-tech industries. Before a bank commits itself it usually asks experts to make a precise technical and financial assessment of the potentialities of the new field. Not only must these experts be remunerated but they may also disagree one with another. Selling stocks provides an easy solution to this thorny assessment problem. When the company is introduced into the stock market it will be scrutinized by all potential buyers;

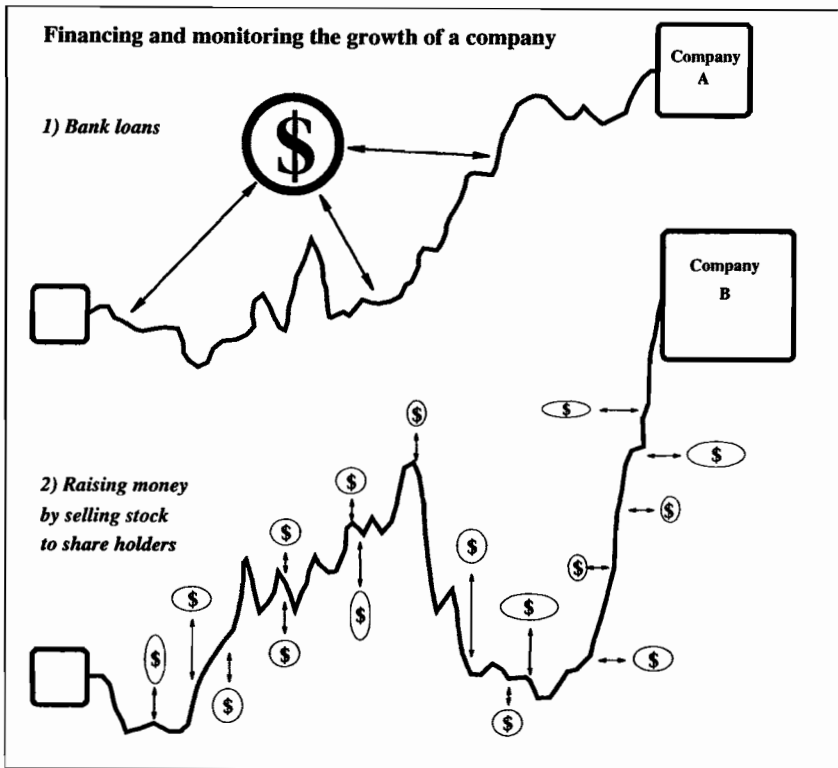
probably they will not all agree but that does not matter; those who think that the field has high expectations will buy the stock while others will simply keep away. It is through their *collective judgment* that the price of the stock will be set. If the project is approved by a majority the price of the stock will go up, otherwise it will fall. In short, the stock market provides the experts, remunerates them, enables them to “vote” and sends the resulting message back to the company in the form of a given stock price level. In other words we have here a machine which collectively is capable of performing a very difficult task. Seen in that way, the buyers and the sellers collectively work in the same way as a neuron network. The shift from bank loans to capital raised by selling stocks is in essence a shift from a visible hand to Adam Smith’s invisible and collective hand. It brings firms in direct contact with the public as schematically represented in Fig.2.8. In a sense, it is direct economic democracy at investment level.

In 1997 some 470 new companies were introduced in American stock markets and these Initial Public Offerings (IPO) raised 24 billion dollars (The Economist 15 Nov. 1997). If our argument is correct and if this is indeed a more efficient way to raise money, it means that in the future many more companies will could “go public” than is currently the case.

### 1.9.2 Two safety nets: investment funds and derivatives

Every rose has its thorn. When a mania floods the market careful judgment can be replaced by credulity, over-confidence, or panic. In order to protect stock holders from such pitfalls, stock exchanges have invented several safety nets. The introduction and rapid development of investment funds in the 1920s and of derivatives (options, swaps and so on) in the 1980s and 1990s were two major steps in that direction. By purchasing shares in investment trusts the average investor gets a well managed diversification of stock holdings; and by selecting a given investment trust rather than another he is still able to “vote”, although this is a kind of representative democracy rather than the direct democracy we mentioned above. The rapid development of investment funds between 1925 and 1929 (their total asset was multiplied by 10) is proof of the fact that they responded to a real need. Of course, when there is a simultaneous crash for all stocks (as was the case in 1929) the protection brought about by diversification becomes ineffective. Subsequently, investment trusts were even blamed for being one of the causes of the crash. May be, but the idea was basically good, as shown by their huge development after World War II.

Derivatives provide protection through hedging; they are in fact of form of



**Fig.2.8 Financing and monitoring the growth of a company.** The figure schematizes two ways of financing the growth of a company, either through bank loans or by selling stocks to share holders. In the first case the growth of the company is monitored by one agent, in the second it is monitored by the average opinion of a large number of agents.

insurance. For instance options enable a purchaser to buy or sell an asset at a certain price on a given date or allow him to walk away if he wishes. It is a generalization to financial markets of the forward transactions that have existed for decades in commodity markets. The rapid development of the derivatives in the 1990s (total transactions were multiplied by 10) was also proof of the fact that they filled a real need. It is true that there have been some accidents: both the bankruptcy of the Barings bank in 1995 and of LTCM (Long Term Capital Management) in 1998 was the result of trading in derivatives. But in spite of such incidents the idea is basically sound. After all, airplane crashes do not call into question aviation. As we have seen even the

disaster of 1929 did not dissuade investors from using investment funds.

### **1.9.3 The development of stock markets in the late 20th century**

Does the previous interpretation account for the development of stock markets in recent decades? It seems it does. Between 1980 and 1997 the number of companies listed on the NYSE increased by 94 percent (from 1570 to 3047) while the number of companies listed on the NASDAQ increased by 90 percent (from 2894 to 5487). Most of the smaller and emerging companies are listed on the less strictly regulated NASDAQ. Even in Europe and in Japan, new markets have appeared in order to help emerging high-tech companies to raise capital. In Europe the EASDAQ (European Association of Securities Dealers Automatic Quotation system) was created in Brussels in the late 1990s, the "Nouveau Marché" (new market) was created in Paris in March 1996, the "Neuer Markt" (new market) started in Germany in March 1997 and the MOTHERS (Market of High Growth and Emerging Stocks) started in Tokyo in 1999. All these markets were more or less built on the model of the highly successful American NASDAQ; by 2000 they were still fairly small but rapidly developing. No doubt that evolution will bring about a much closer connection between companies and the general public.

### **1.9.4 Organization of the market**

For the sake of brevity we restrict ourselves to American stock markets. Table 2.8 gives a summary of the main markets.

There are basically two kinds of markets: markets with a specific geographical location and the so-called over the counter (OTC) markets where shares are traded by telephone or by inter-connected computers. Among the first, the New York Stock Exchange (NYSE) is by far the largest. In fact it is the largest in the world; in terms of capitalization it was surpassed only by the Tokyo stock market when the latter was at its peak in 1989. In the United States since the mid-1980s stock market events are closely monitored by TV networks. In 1989 NBC (News and Business Channel) decided to broadcast twice an hour from the floor of the exchanges.

Most of the trade in derivatives takes place on the over the counter markets. These markets have many advantages in terms of flexibility and transaction costs, but they also have some drawbacks. For instance in an OTC market there is a risk of one of the contractors going bust and refusing to pay.

From the perspective of speculative trading there is a characteristic of American stock markets that is worth mentioning, namely the so-called special-

**Table 2.8 Stock markets in the United States**

	Number of companies			Capitalization [billion dollars]	
	1980	1997	1990	1996	1999
<b>1) New York</b>					
NYSE (New York Stock Exchange)	1,570	3,047	2,820	7,300	11,000
AMEX (American Stock Exchange)	973		102		
<b>2) Electronic markets</b>					
NASDAQ	2,900	5,500		1,500	5,000
OTC (Over The Counter)			mainly derivatives		
<b>3) Regional markets</b>					
Chicago: Midwest Stock Exchange				less than 5%	
Philadelphia: Philadelphia Stock Exchange				less than 3%	
Boston, Cincinnati, Denver, Salt Lake City, San Francisco				less than 3%	

Notes: NASDAQ means National Association of Securities Dealers Automatic Quotation system. Since 1953 the AMEX has replaced the former New York Curb Exchange. . In March 1998 an agreement was settled for a possible future merging of NASDAQ and AMEX.

Sources: *Quid* (p. 2205), *Bruchey* (1991), *Le Monde* (14 March 1998).

ist system. Specialists are members of the Exchange whose obligation is to maintain an orderly market. Acting as buffers between the public and the market, they serve as dealers when there is insufficient public interest to accommodate sellers or buyers at prices reasonably close to the last trade. Thanks to their participation 92 percent of all transactions that occurred in 1990 on the American Exchange were within 0.12 points of the last sale (Bruchey 1991). Their role is particularly important in the event of a panic. For instance during the crash of 14-20 October 1987 they were responsible of about 22 percent of the purchases and 16 percent of the sales whereas on average is the late 1980s they accounted for only 10 percent of the trading volume. In the days following the crash (21-25 October) they were responsible of 17 percent of the purchases and 21 percent of the sales (Bruchey 1991). By permitting to avoid panics the specialist system can have a decisive influence not only on short-term price fluctuations but even on the whole subsequent business situation.

## 2 Comparative perspective

In the previous section we have examined each market separately; actually, they are more or less closely connected. This will be the theme of a subsequent chapter. In the present section we consider these markets in a global, comparative perspective. To begin with, we try to compare their relative weights.

### 2.1 Relative weight of various speculative markets

From table 2.9 it can be seen that in terms of capitalization, real estate and stock markets have grossly a similar weight. The weight of the other markets is negligible in comparison with these two giants. Let us emphasize once again that if we study the other markets it is not because they are economically important but because of their simplicity.

### 2.2 Turn over ratio

Table 2.10 introduces the notion of *turn over ratio* which is obtained by dividing the value traded (i.e. the turn over) by average market capitalization. For gold or diamonds capitalization is understood as the value of the total stock existing in the world. In terms of turn over ratio there are three groups; (i) the stock markets which have a high turn over ratio (ii) Real estate with a ratio

**Table 2.9 Relative weight of speculative markets**

	Percent of GDP	Source
<b>A. In terms of total value traded</b>		
1) Real estate:		
Paris (1997)	0.4	Marché Immobilier Français (1998)
United States (1992)	17	Le Monde (10 March 1992)
2) Stocks (shares)		
Paris (1994)	13	Quid (p.2210)
NYSE (1996)	60	Statistical Abstract of the US
3) Art: France	0.02	Peyrelevade
4) Postage stamps: France	0.01	Roehner et al. (1999)
5) Antiquarian books: France (1993)	0.01	see notes
<b>B. In terms of capitalization</b>		
1) Real estate		
Paris (1997)	13	Marini et al.
United States (1992)	160	Le Monde (10 March 1992)
2) Stocks (shares)		
Paris (1994)	31	Quid (p.2210)
NYSE (1996)	90	Statistical Abstract of the US
Tokyo (1990)	150	Wood

Notes: Although the GDP (gross domestic product) is a variable of a different nature than either the total value traded or the capitalization, it seemed convenient to use it as a yardstick of comparison. Note that the French real estate data are restricted to Paris *intra muros*, i.e. without the suburbs. The value traded for antiquarian books was obtained on the following basis: 100 auction sales a year, 300 lots sold at each sale, average price of a lot 3,000 French francs, sales in bookshops about the same order of magnitude as auction sales.



between 4 and 10 percent (iii) Gold and diamonds which have an even lower ratio.

**Table 2.10 Turn over ratio of speculative markets**

Market	Turn over ratio	Source
1) Real estate		
Paris (1997)	4 %	see Table 2.9
United States (1992)	11 %	see Table 2.9
2) Stocks		
Paris (1994)	43 %	see Table 2.9
NYSE (1996)	55 %	see Table 2.9
United States (1998)	106 %	ESMF (1999)
Japan (1998)	40 %	ESMF (1999)
Chile (1998)	7 %	ESMF (1999)
3) Gold: world (1990)	5 %	Quid (p.2188)
4) Diamonds: world (1980)	2 %	Epstein

Notes: The turn over ratio is calculated by dividing the value traded by average market capitalization. Except for emerging markets such as Chile, stock markets are characterized by a fairly high turn over ratio; in other words, they are liquid markets. ESMF means Emerging Stock Market Factbook.

### 2.3 Price earnings ratio

The ratio of the current price of a stock to past (or expected) annual earnings is used to estimate the price level of a stock. From 1871 to 1996 the PER of US stocks averaged 14. Before the crash of October 1929 it reached a level of 22. Between January 1986 and the crash of October 1987 the PER (for Standard and Poor's stocks) increased from 12 to 30. Before the crash of November 1989 in Japan the PER was at a level of about 50 (Galletly 1988, Schwert 1996). In January 2000 the PER of the NASDAQ was at a level of 200 while the PER of the 30 Dow Jones Industrial stocks was around 28 (Washington

Post 12 Jan. 2000, Dallas Morning News 26 Feb. 2000).

But stocks are not the only values for which one can define a PER. The same concept can be defined for property; in that case the earnings are represented by the monthly rent received by the owner. Before the 1990 property crash in Paris the PER for a 3-room apartment was about 2 million FF/ 72,000 FF = 28; in the mid-1990s it had dropped to 21.

For other speculative items for which there are no earnings one cannot define a PER. However, for rare postage stamps one can define what can be called a generalized PER based on the following argument: observation shows that the deflated price of 19th century French stamps increased fairly steadily between 1920 and 1975 at an annual rate of 5.2 percent (Roehner et al. 1999). If one accepts to interpret that increased valuation as a kind of dividend this leads us to a PER of  $1/0.052 = 19.2$ .

The interesting point is that, if we exclude the somewhat exotic value reached on the NASDAQ, most of the above figures are in a rather narrow range between 15 and 30. Each time the PER reached the lower or upper bound of this interval a change in the trend rate occurred.

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