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BUBBLE INVESTING: LEARNING FROM HISTORY

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ABSTRACT

History is important to the study of financial bubbles precisely because they are extremely rare events, but history can be misleading. The rarity of bubbles in the historical record makes the sample size for inference small. Restricting attention to crashes that followed a large increase in market level makes negative historical outcomes salient. In this paper I examine the frequency of large, sudden increases in market value in a broad panel data of world equity markets extending from the beginning of the 20th century. I find the probability of a crash conditional on a boom is only slightly higher than the unconditional probability. The chances that a market gave back it gains following a doubling in value are about 10%. In simple terms, bubbles are booms that went bad. Not all booms are bad.

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I. Introduction

The broad awareness of financial history seems to correlate to extreme market events. For example, the closest comparison to the Dot-Com bubble of the 1990's was the run-up in U.S. stock prices in the 1920's. During the 2008 financial crisis, the financial press frequently referenced past bubbles– periods of market euphoria followed by sharp price declines. In this paper I argue that using past crashes in this way is misleading to both investors and policy-makers. Particularly during periods of market booms, focusing attention on a few salient crashes in financial history ignores the base rate for bubbles. In simple terms, bubbles are booms that went bad but not all booms are bad.

To illustrate this last point, I present empirical evidence drawn from more than a century of global stock market data. I define a bubble as a large price decline after a large price increase or, a crash after a boom. I find that the frequency of bubbles is quite small. The unconditional frequency of bubbles in the data is 0.3% to 1.4% depending on the definition of a bubble. Not only are bubbles rare but conditional upon a market boom (i.e. increasing by 100% in a one to three year period). Crashes that gave back prior gains happened only 10% of the time. Market prices were more likely to double again following a 100% price boom.

Prior to the empirical analysis, I present evidence about bubbles (as well as the lack of them) in very early equity investments. Thus, the next section discusses some of the early bubbles in financial history. Section III describes the databases used in the study and the empirical analysis. Section IV discusses the implications of the results for investors and regulators.

II. Data on Markets and Bubbles

The first bubbles precede the development of organized stock exchanges. Stuart Jenks reports evidence of a bubble in speculative German mining shares, *kuxe*, at the end of the 15th century.[1] Fractional equity interest in individual silver mines in the Hartz mountain district were evidently freely traded, purchased on credit and occasionally had option-like features. Transactions were settled at financial fairs during which share prices could fluctuate dramatically.

[1] Jenks, Stuart, ND, "THE FIRST BUBBLE Silver mining in the Saxon Erzgebirge, c. 1470-1540" http://vkc.library.uu.nl/vkc/seh/research/Lists/Seminar%20Program/Attachments/37/The_first_bubble.PDF. He cites Werner (1936) and Laub (1974) for empirical price evidence.

These were famously condemned by Martin Luther in 1554: *"Ich will kein kuks haben! Es ist spiegelt, und es will nicht wudeln [gedeihen] dasselbige gelt."* "I will have nothing to do with kuxen. They are play money and will not generate hard cash."

In 1502, on the eve of sailing on his final voyage, Christopher Columbus expressed a desire that his son use his inheritance to purchase shares in the Casa di San Giorgio in Genoa which he observed would generate "6 % interest and constitute a very safe investment."[2] The firm was a financial institution that owned and managed government contracts and ultimately became a bank. Its board regularly declared dividends and these, as well as the shares themselves, were actively traded.[3]

Shares in Genoa's Casa di San Giorgio fluctuated considerably in the 16th century. Figure 1 shows an index of prices and yields. The dramatic doubling of prices in 1602 looks like a bubble to the modern eye because yields declined from 3% to 1 ½%. This bubble sustained itself for a long time however, prices did not drop back to their former level until 1683. Likewise, a peak in 1622 looks *ex post* like a bubble, although the fortunes of Genoa as a financial power in the early 17th century also fluctuated considerably. The variation on both occasions might be due to rational speculation on events of the time. Nevertheless, they appear to fit a price-based definition of a bubble. This bubble pattern is not ubiquitous in the early history of equity shares. In Le Bris et al. (2014) we found no evidence of a bubble in the trading history of an even older corporation. Stock prices for the Bazacle milling company of Toulouse, over an extended period from the 1530's to 1946, moved fairly closely with dividends.

The first discussions in England of a stock market bubble centered on the speculation in shares for start-up companies during the 1690's. McCleod (1986) argued that intellectual property rights were more likely the excuse for stock market speculation rather than the basis for real valuation in this first English market bubble.

The first great stock market bubble began in France, with the creation of the Mississippi Company by John Law which was an ingenious financial innovation that merged a bank empowered to issue currency with companies chartered for overseas trade– hence the name Mississippi Company. The price of shares grew by more than 10 times during 1719 and 1720.

[2] Harrisse, Henry, 1888, Christopher Columbus and the Bank of Saint George (Ufficio Di San Giorgio in Genoa): Two Letters Addressed to Samuel L.M. Barlow, Esquire, Priv. print. [Chiswick Press; C. Wittingham and Company, London].
[3] Cf. Fratianni (2006).

The Mississippi Bubble burst in the spring of 1720 when shares were made exchangeable with paper currency at a fixed rate, resulting in a massive government commitment to propping up share prices by printing money.[4] The Mississippi Bubble was followed shortly by the South Sea Bubble in London and a smaller but significant bubble for shares in the Netherlands. The British and Dutch bubbles subsequently burst in late 1720, and by the end of the year, the boom in stock market speculation was effectively over.

My co-authors and I have worked to understand the basis for this remarkable sequence of international stock bubbles from 1719-1720.[5] We found empirical and archival evidence that regulatory enforcement following the Bubble Act in London triggered a crash in the prices of insurance company stocks and that this ultimately spread to the large trading companies and banks in the UK and then overseas to the Dutch West Indies Company and a number of recently launched companies in the Netherlands.

Figure 2 illustrates the parallel growth in share prices for selected companies in London and Amsterdam in this period. The three London companies are Royal Exchange Assurance, London Assurance and the South Sea Company. The two Dutch companies are the Dutch West Indies Company and Stad Rotterdam– an insurance company whose successor firm still exists today. The figure shows the scale of the London and Amsterdam bubbles. The South Sea Company rose by a factor of 7.5 over the year leading to the eponymous "South Sea Bubble." The two marine insurance companies grew much more by multiples of more than 10 and 13. Only the Dutch West Indies Company grew at a comparable scale in Amsterdam by a factor of 7. Stad Rotterdam did not quite double before declining in price. The graph also shows how inter-connected the Dutch and British bubbles were. Although they rose at different times in the year 1720, the crash in the prices of the London insurance firms and the Dutch West Indies Company occurred at about the same time (a few days lag is consistent with travel times between the two financial centers).

In the United Kingdom, the Bubble Act curtailed the issuance and trading of unauthorized company shares and set back the development of an equity market as a vehicle for a financing enterprise. In the Netherlands, there was no such governmental response but nevertheless, initial public offerings stopped and a cultural re-examination of stock market speculation occurred. Stock

[4] C.f. Murphy (1997) & Velde (2009).
[5] Cf. Frehen et al (2013).

schemes were ridiculed and speculators were caricatured. One curious legacy of the 1720 international stock market bubble was a lavishly illustrated volume, *Het Groote Tafereel Der Dwaasheid,* or *The Great Mirror of Folly*, a book of satirical poems, prints, plays and engravings specifically intended to preserve the memory of the folly of speculation during the crisis.

Bubbles make interesting stories. Charles MacKay's classic book, *Memoires of Extraordinary Popular Delusions and the Madness of Crowds,* was first published in 1852 and is still in print. Using illustrations redrawn from *The Great Mirror of Folly,* MacKay poked fun at both the South Sea Bubble and the Mississippi Company including them along with chapters on alchemy, fortune-telling and "magnetizers." MacKay regarded stock speculation as a "madness which infected the people of England."

In Frehen et al. (2013) we used cross-sectional evidence from the 1720 bubble to argue that the stock boom in 1720 was founded on economic fundamentals including the economic potential of trans-Atlantic trade, innovations in maritime insurance and the potential of the publicly traded corporation itself as a vehicle for enterprise. Nicholas (2008) likewise, used cross-sectional evidence for companies with patents in the 1920's. He shows that, *ex-post*, firms with valuable patents, rose relatively more. In seeking to understand the economics underlying the causes of bubbles, Pástor, L', & Veronesi, P. (2009) build a model of technological innovation and test it on cross-sectional historical data from the 19th century railroad boom in the U.S. Perez (2009) explored the relationship between technological innovation and financial innovation in five major bubbles that occurred in the 19th, 20th and 21st centuries. In each of these cases evidence suggests that there was at least some method to the madness of the investors. While potentially overly-optimistic about valuations for new technology companies, investors in these bubbles identified, *ex ante,* the potential transformative value of innovations.

III. Analysis

III.1 Data

This brings us to the empirical analysis of market booms and busts. Dimson, Marsh and Staunton (DMS) have constructed an annual database of equity returns for 21 of the world's stock markets by collecting stock and dividend data beginning in 1900 and extending through 2014. We used their equity total return real return indexes denominated in dollars as our market measures for these countries. We augmented these with the annualized dollar-denominated stock market indexes used in Jorion and Goetzmann (1999) (JG). For countries in DMS, we dropped the JG indexes resulting in 20 remaining JG indexes.

The JG indexes are taken mostly from contemporaneous sources that sought to track indices in real time. The League of Nations (LofN) maintained indexes for several countries beginning in 1919 and these were continued by the United Nations (UN). We collected these indexes in a "follow forward" manner from the published periodicals and linked them to IFC indexes available in the 1990's. The advantage of augmenting the DMS series is that the JG database contains a number of markets that failed or disappeared during the 20th century due to wars, revolutions and various other reasons.

Reliance on LofN and UN sources means that we do not control the manner in which the indexes were created and cannot be sure that the capital appreciation returns we calculated were actually obtainable. On the positive side, the JG indexes derive from documentary data widely available in libraries through much of the 20th century. Hence, the frequency of past bubbles since at least 1920 has been available for establishing a "base rate" for price run-ups and crashes and their coincidence in time.

We include two additional series constructed for the International Center for Finance (ICF) at the Yale School of Management– The Saint-Petersburg Stock Exchange and the Shanghai Stock Exchange are both dollar-denominated, total return indexes. Finally, we augment both the JG and ICF series with FTSE dollar-denominated price appreciation series available in the Morningstar EnCorr database. We have not used the IFC or FTSE indexes to add additional markets, although these could provide an even broader set of indexes. The reason is survival-conditioning bias. Taking markets that exist today and tracing them back may result in a series that is mean-reverting or displays more complex time-series behavior associated with recent growth (cf. Goetzmann and

Jorion, 1999). This could then bias the analysis of stock market performance conditional on a boom, which is our aim.

Table 1 lists the markets in this study and calculates summary statistics for the DMS and the JG/ICF databases. Note that the JG/ICF series are discontinuous and start and stop at various intervals. They are generally considered emerging markets and have a strong representation of South American, Central American and Eastern European countries. The JG/ICF series are more volatile by far, with an average standard deviation of 50% per year. On the other hand, their average annual returns for years we have data is no higher than the DMS series. For series known to have been expropriated, a minus 100% return is included.

III.2 Booms and Crashes

For the purposes of this analysis, a bubble is defined as a boom followed by a crash. A boom is a large, rapid increase in stock prices. A crash is a large, rapid decline in market prices. What is large? What is rapid? Table 2 defines booms in two ways: (1) a single year in which a market value (or cumulative return) increased by at least 100%; (2) a period of three years over which the market increased by 100%. This second definition is chosen so as to include the famous U.S. bubbles of the 1920's and 1990's.

A crash is defined as: (1) a drop of at least 50% in the following year; (2) a drop of at least 50% over the next five years. There are other ways to use price dynamics to define a bubble. For example, a high price-earnings ratio is a common metric invoked as a bubble indicator. Long-term data for dividends are not available for most of the markets examined here. However, most people would agree that a doubling in market prices followed by a halving in value is a significant reversal, and further absent are details about economic fundamentals. Thus, this study can be interpreted as focusing on one common notion of a bubble, but not the only one.

Table 2 reports results for each of the two bubble definitions. The first horizontal block in panel one shows the unconditional counts of market-years and the frequency of doubling and halving. Column one, for example, shows that there are 3,470 market-years in the database, 72 of which were returns over 100% and 84 of which were returns under 50%. Moving to column two, the market-year count declines to 3,308 reflecting the requirement of a prior year return.[6] Two

[6] That is, conditional upon the existence of a return in a prior year, what is the frequency of doubling or halving. This excludes, for example, the first year in a series, and a year following a resumption of market data after a break.

percent of these market years (i.e. years with an existing prior year) were returns in excess of 100%.

In the next horizontal block, Table 2 follows the 72 market years that had 100% or better growth in a calendar year. The conditional frequency of doubling in the subsequent year is 8.33% which is much higher than the population fraction in the block above. This is not surprising given that a doubling is more likely in volatile markets. Likewise, the probability of halving is 4.17% which is about twice the unconditional probability. Six of the 72 "doubling" markets more than doubled again in the following year. Three of the 72 declined by a half or more, essentially giving back the prior year's gains. Table 3 identifies these reversal events which are Argentina in 1976-77, Austria in 1923-24 and Poland in 1993-94.

Bubbles may take some time to deflate. Counts and frequencies at the five year horizon are reported for the T+5 columns in Table 2. After five years, 15.28% percent of the boom markets had crashed to less than half their levels at T=0. On the other hand, 26.93% of the markets had at least doubled in value again. After a stock market boom of at least 100% in a single year, the frequency of doubling in the next five years was significantly greater than the frequency of halving.

Note that the frequency of crashing at the five year horizon is significantly higher for booming markets than the unconditional frequency, while the frequency of doubling after five years is about the same. Thus, a boom *does* increase the probability of a crash, however the crash probability is low. A rapid boom is not a strong indicator of a bust– probabilities move from 2% to 4% at the one year horizon and from 6% to 15% at the five year horizon. The significance of this shift depends of course on investor risk aversion. From a historical perspective, it is important to recognize that the overwhelming proportion of booms that doubled market values in a single calendar year were not followed by a crash that gave back these gains.

Table 2 also includes results for markets that halved in value in a single year. These are similar to the doubling market results. Subsequent tail events (doubling or halving) at the one year and five year horizons are higher than the unconditional probabilities of these events.

Doubling in a single year may be too restrictive as a definition of a boom. The Dot-Com bubble of the 1990's evolved over several years. Panel two of Table 2 reports results for the second definition of a boom– one that doubles market value over a three year horizon. This definition is chosen so that it includes the U.S. booms of 1928 and 1999. This definition also includes booms in the US in 1935, 1945, 1956 and 1997. This broader definition of a boom generates 460 events

of a doubling over three years– roughly 14% of the overlapping three year return periods in the data. In the context of global equity markets, the 1928 and 1999 booms were not that unusual, although three-year bubbles were not common. After a three year run-up, markets subsequently halved in the following year 4.57% of the time. This is about twice the unconditional probability of a one year halving event, but it is still rare. At the five year horizon, the probability of the market value declining by a half after five years is 10.42%, which is higher than the unconditional probability of 6.31% but not dramatically so.

One important caveat– the frequencies in Table 2 are conditional upon data existing in subsequent years after the event of interest. I've taken care to include markets known to have closed after wars and revolutions, and assigned -99% returns to them. A robustness test that assigns a -100% return to *all* missing observations (not reported) increases the frequency of halving for both conditional and unconditional distributions but not the basic result that conditioning of a boom has a relatively minor effect.

Past studies of the mean reversion of stock markets suggests that what goes up must come down and thus a large boom should increase the probability of a future decline. However, focusing on the rejection of the null of no association between past and future multi-year market returns can be misleading for economic decision-making. The fact that probabilities of a decline increase from 6% to 10% following a three year boom may not be as relevant to investor choice as the fact that the chance of doubling in value is twice the chance of halving in value over that same horizon.

IV. Conclusion

The most important thing a financial historian can tell investors about bubbles is that they are rare. Indeed any discussion of bubbles quickly turns to history because recent evidence is lacking. Most models and analysis of stock market bubbles focuses on a few well-known instances. Gathering data about the world's stock markets helps to fill in this lack of empirical evidence. The DMS and JG/ICF data provide some insight into the rarity of bubbles. The overwhelming proportion of price increases in global markets were not followed by crashes.

Investor decision making under uncertainty involves a consideration of the probabilities of future outcomes and attitudes about these outcomes. The bubbles that did not burst are just as important for investors to know about as bubbles that did burst. Placing a large weight on avoiding a bubble, or misunderstanding the frequency of a crash following a boom, is dangerous for the

long-term investor because it foregoes the equity risk premium. If investors in the shares of the Casa di San Giorgio had sold out in 1603, they would have missed a 20 year boom in prices and would have had to wait 80 years to be proven right.

For regulators, the evidence raises the question of whether deflating a bubble is the right course of action. If a bubble is associated with investment in new technologies with high economic potential as well as high economic uncertainty, it forces a choice between guarding against a financial crisis vs. allowing productive investment.

This chapter presents a preliminary examination of bubbles in stock markets around the world over the last 115 years. While economists often focus on a few representative and memorable bubbles, the analysis presented here suggests there are dozens more we should investigate. The list in Table 3 is a good starting point for financial historians seeking to understand what factors determine whether a boom turns into a bust. Learning something about the fundamentals underlying these other bubbles may help to more rationally assess the causes of booms and crashes and their consequences– economic, financial and regulation.

Table 1: Summary Statistics for Global Markets

Data sources: (1) Total return indices for stock markets in 21 countries over the period 1900 to 2014, converted to U.S. dollars, provided by Dimson, Marsh and Staunton [DMS Global] via Morningstar. (2) Real capital appreciation indices for 18 countries from 1919 onwards used in Jorion & Goetzmann (1999) and available on the website of the ICF. It is constructed from indices reported in League of Nations and United Nations periodicals, augmented with published IFC data. (3) Total return indices in U.S. dollars for Russia and China from the International Center for Finance (ICF) at the Yale School of Management, constructed from official publications and/or newspaper sources. Jorion-Goetzmann & ICF indices are augmented for recent years by the FTSE and IFC country dollar-denominated stock market appreciation indices as available via Morningstar.

country	Source	period	mean	std	max	min	Source	period	period	mean	std	max	min
Australia	DMS	1900-2014	0.13	0.24	1.07	-0.53	India	JG&FT	1940-2014	0.07	0.28	1.01	-0.65
Austria	DMS	1900-2014	0.09	0.39	2.00	-0.69	Pakistan	JG&FT	1961-2014	0.08	0.34	1.22	-0.75
Belgium	DMS	1900-2014	0.09	0.26	1.28	-0.50	Philippines	JG&FT	1955-2014	0.13	0.87	6.21	-0.63
Canada	DMS	1900-2014	0.11	0.20	0.72	-0.46	Argentina	JG&FT	1948-2014	0.19	0.92	4.55	-0.86
Denmark	DMS	1900-2014	0.11	0.24	1.06	-0.50	Brazil	JG&FT	1952-2014	0.19	0.60	2.32	-0.69
Finland	DMS	1900-2014	0.13	0.34	1.28	-0.72	Chile	JG&FT	1928-2014	0.12	0.39	1.18	-0.53
France	DMS	1900-2014	0.10	0.29	1.07	-0.73	Colombia	JG&FT	1937-2014	0.08	0.39	1.88	-0.55
Germany	DMS	1900-2014	0.18	0.80	7.00	-0.79	Mexico	JG&FT	1935-2014	0.14	0.37	1.15	-0.79
Ireland	DMS	1900-2014	0.10	0.26	1.10	-0.67	Peru	JG&FT	1942-1977, 1989-2014	0.11	0.44	2.23	-0.71
Italy	DMS	1900-2014	0.10	0.34	1.52	-0.62	Uruguay	JG&FT	1937-1943	0.10	0.21	0.32	-0.26
Japan	DMS	1900-2014	0.13	0.33	1.32	-0.92	Venezuela	JG&FT	1938-2007	0.08	0.55	3.90	-0.76
Netherlands	DMS	1900-2014	0.11	0.25	1.30	-0.63	Czech	JG&FT	1920-1944, 1995-2014	0.08	0.36	1.13	-1.00
New Zealand	DMS	1900-2014	0.12	0.26	1.40	-0.50	Greece	JG&FT	1930-1939, 1998-2014	0.14	0.60	2.74	-0.67
Norway	DMS	1900-2014	0.12	0.32	1.84	-0.63	Hungary	JG&FT	1926-1940, 1995-2014	0.10	0.44	1.05	-1.00
Portugal	DMS	1900-2014	0.14	0.44	2.05	-0.74	Poland	JG&FT	1922-1938, 1993-2014	0.24	1.25	7.45	-1.00
South Africa	DMS	1900-2014	0.13	0.30	1.86	-0.43	Romania	JG&FT	1938-1940, 2006-2014	-0.08	0.43	0.54	-1.00
Spain	DMS	1900-2014	0.10	0.28	1.51	-0.50	Egypt	JG&FT	1938-1961, 1995-2014	0.17	0.48	1.54	-0.54
Sweden	DMS	1900-2014	0.12	0.25	0.72	-0.54	Israel	JG&FT	1951-2014	0.13	0.35	0.86	-0.70
Switzerland	DMS	1900-2014	0.10	0.21	1.04	-0.35	China	ICF&FT	1900-1940, 1994-2014	0.04	0.31	1.20	-1.00
United Kingdom	DMS	1900-2014	0.11	0.24	1.12	-0.50	Russia	ICF & IFC	1900-1913, 1998-2014	0.17	0.67	2.85	-1.00
United States	DMS	1900-2014	0.13	0.20	0.63	-0.44							
		average	0.12	0.31	1.57	-0.59			average	0.11	0.51	2.27	-0.76
		median	0.11	0.26	1.28	-0.54			median	0.11	0.43	1.38	-0.73
		std deviation	0.02	0.13	1.31	0.14			std deviation	0.07	0.25	1.91	0.20
		min	0.09	0.20	0.63	-0.92			min	-0.08	0.21	0.32	-1.00
		max	0.18	0.80	7.00	-0.35			max	0.24	1.25	7.45	-0.26

Table 2: What happened when a stock market doubled or halved in value

A boom is defined as either (1) a return of more than 100% to a stock market index within a single year, defied according to availability in real or dollar-valued and total or capital appreciation only or (2) a return of more than 100% to a stock market index within a three year calendar period, defied according to availability in real or dollar-valued and total or capital appreciation only. A bubble is a boom followed by a bust, defined as either (1) more than a 50% decline in index value in the following year or (2) more than a 50% decline over the following five years. The conditional bubble frequency is the percentage of booms followed by a bust. A crash is similarly defined as a decline in real or dollar-valued and total or capital appreciation of a market index within a one year or a three year calendar period. Missing observations due to interruption of market are deleted from frequency calculation. Data sources are reported in Table 1.

100% Real One-Year Price Increase

	T=0	T+1			T+5		
	Count	Count	conditional frequency	unconditional frequency	Count	conditional frequency	unconditional frequency
Market-Year Counts (frequencies)	3387	3308		100%	3122	-	
Double in value		68	-	2.06%	803	-	25.72%
Halve in value		73	-	2.21%	197	-	6.31%
Years with a 100% real price increase	72	72		2.13%	72		2.13%
Counts (frequencies) of doubling		6	8.33%	0.18%	19	26.39%	0.56%
Counts (frequencies) of halving		3	4.17%	0.09%	11	15.28%	0.32%
Years with subsequent a -50% decline	84	76		2.48%	75		2.21%
Counts (frequencies) of doubling		10	13.16%	0.30%	27	36.00%	0.80%
Counts (frequencies) of halving		5	6.58%	0.15%	7	9.33%	0.21%

Table 2 Continued: 100% Real Three Year Price Increase

	T=0	T+1			T+5		
	Count	Count	conditional frequency	unconditional frequency	Count	conditional frequency	unconditional frequency
Counts (frequencies)	3271	3186		100%	3200	-	
Double again in value		70	-	2.20%	788	-	25.90%
Halve in value		74	-	2.32%	192	-	6.31%
Three year periods with a 100% increase	460	460		14.06%	451		13.79%
Counts (frequencies) of doubling		17	3.70%	0.52%	98	21.73%	3.00%
Counts (frequencies) of subsequent halving		21	4.57%	0.64%	47	10.42%	1.44%
Three year periods with a -50% decline	203	178		6.21%	179		5.47%
Counts (frequencies) of doubling		15	8.43%	0.46%	85	47.49%	2.60%
Counts (frequencies) of subsequent halving		6	3.37%	0.18%	14	7.82%	0.43%

Table 3: Markets that doubled in value in dollar (or real) terms in a calendar year

This table reports the cumulated dollar-valued capital appreciation return to markets following a calendar year in which the dollar-valued index level at least doubled. Subsequent event-years in which the index value doubled again are highlighted in green. Subsequent event years in which the index gave back all or more of its one year gain at some point in the next five years are highlighted in pink. Values are sorted on event-year five cumulative capital appreciation returns.

Country	year	-1	0	1	2	3	4	5
Germany	1949	0.12	1	1.01	2.35	3.52	4.43	8.08
Peru	1989	0.31	1	0.77	1.61	3.54	4.43	6.41
Portugal	1985	0.38	1	3.05	8.82	6.24	8.04	6.09
Chile	1986	0.47	1	1.25	1.53	2.22	2.67	5.49
Peru	1991	0.48	1	2.20	2.75	3.98	4.85	4.72
Germany	1951	0.43	1	1.49	1.88	3.43	4.01	3.77
Brazil	1991	0.37	1	1.05	1.84	3.02	2.38	3.28
Austria	1985	0.33	1	1.22	1.21	1.30	2.90	3.28
Colombia	2004	0.44	1	2.02	2.24	2.53	1.83	3.23
United Kingdom	1975	0.47	1	0.86	1.48	1.76	2.14	3.08
Russia	1999	0.26	1	0.68	1.05	1.45	2.54	2.91
Pakistan	2002	0.45	1	1.31	1.42	2.23	2.19	2.90
Egypt	2004	0.46	1	2.54	2.92	4.53	2.09	2.77
Peru	1992	0.46	1	1.25	1.81	2.21	2.15	2.53
Colombia	2005	0.49	1	1.11	1.25	0.90	1.59	2.24
Italy	1985	0.42	1	1.71	1.45	1.64	2.35	2.18
Brazil	1969	0.30	1	1.79	3.45	1.84	1.94	2.15
Chile	1977	0.49	1	1.96	3.59	6.84	4.22	2.15
Brazil	2003	0.49	1	1.30	1.96	2.75	4.82	2.04
Portugal	1986	0.33	1	2.90	2.05	2.64	2.00	1.92
Spain	1986	0.40	1	1.38	1.63	1.88	1.67	1.89
Japan	1952	0.43	1	1.00	1.01	1.47	2.06	1.87
Argentina	1976	0.18	1	0.48	1.28	4.48	3.98	1.82
Australia	1933	0.48	1	1.15	1.41	1.60	1.98	1.77
Germany	1985	0.44	1	1.37	1.09	1.27	1.82	1.75
Finland	1933	0.45	1	1.12	1.26	1.84	1.85	1.75
Germany	1923	0.23	1	1.09	0.71	1.69	1.57	1.74
Chile	1991	0.49	1	1.18	1.55	2.19	2.05	1.71
Colombia	1991	0.35	1	1.22	1.61	2.11	1.51	1.61
South Africa	1933	0.35	1	1.31	1.52	1.94	1.62	1.58
Switzerland	1985	0.49	1	1.39	1.29	1.35	1.61	1.57
Denmark	1972	0.48	1	1.12	1.03	1.33	1.48	1.54
Czech	1922	0.47	1	1.17	1.03	0.98	1.05	1.52
China	2003	0.45	1	0.91	1.02	1.97	3.18	1.50
Greece	1933	0.27	1	1.17	1.18	1.20	1.49	1.39
Philippines	1986	0.14	1	1.37	1.64	1.88	1.35	1.38

Country	year	-1	0	1	2	3	4	5
Italy	1933	0.46	1	1.26	1.33	1.19	1.35	1.34
Belgium	1940	0.44	1	1.77	1.92	1.75	1.36	1.33
Hungary	1996	0.49	1	1.95	1.77	1.96	1.42	1.28
Japan	1972	0.46	1	0.84	0.73	0.85	1.08	1.28
Portugal	1942	0.45	1	0.94	1.15	1.30	1.43	1.20
Egypt	2005	0.39	1	1.15	1.78	0.82	1.09	1.19
Ireland	1977	0.48	1	1.55	1.55	1.68	1.41	1.16
New Zealand	1933	0.42	1	1.15	1.19	1.18	1.24	1.09
India	2009	0.50	1	1.19	0.74	0.92	0.87	1.06
South Africa	1979	0.49	1	1.56	1.22	1.50	1.51	1.02
Austria	1989	0.45	1	1.13	0.94	0.75	0.99	1.00
Norway	1979	0.35	1	0.81	0.69	0.49	0.88	0.96
Mexico	1991	0.46	1	1.23	1.82	1.08	0.79	0.93
Argentina	1991	0.20	1	0.61	0.95	0.71	0.78	0.91
Argentina	1978	0.38	1	3.51	3.12	1.43	0.55	0.79
Portugal	1980	0.37	1	0.64	0.39	0.29	0.30	0.78
Austria	1946	0.49	1	1.12	0.53	0.53	0.44	0.75
Finland	1999	0.44	1	0.85	0.56	0.44	0.58	0.67
Netherlands	1940	0.43	1	0.72	0.80	0.97	0.73	0.67
Austria	1923	0.40	1	0.48	0.36	0.48	0.60	0.63
Russia	2009	0.49	1	1.23	0.97	1.08	1.11	0.59
Venezuela	1996	0.44	1	1.27	0.60	0.61	0.62	0.56
Portugal	1987	0.35	1	0.71	0.91	0.69	0.66	0.54
Italy	1944	0.40	1	0.53	0.49	0.42	0.47	0.52
Brazil	2009	0.45	1	1.04	0.78	0.75	0.61	0.51
New Zealand	1986	0.47	1	0.64	0.57	0.63	0.40	0.48
Norway	1973	0.44	1	0.60	0.51	0.58	0.45	0.48
Poland	1993	0.12	1	0.45	0.43	0.67	0.51	0.47
Venezuela	1990	0.20	1	1.34	0.59	0.69	0.58	0.44
Philippines	1993	0.45	1	0.92	0.81	0.94	0.35	0.39
Germany	1926	0.42	1	0.93	1.03	0.78	0.57	0.36
Chile	1933	0.46	1	0.98	0.46	0.44	0.44	0.33
France	1941	0.48	1	0.57	0.99	1.14	1.06	0.28
Poland	1927	0.47	1	0.88	0.57	0.39	0.21	0.20
Argentina	1979	0.28	1	0.89	0.41	0.16	0.23	0.18
Germany	1940	0.49	1	1.15	1.07	0.88	0.75	0.16

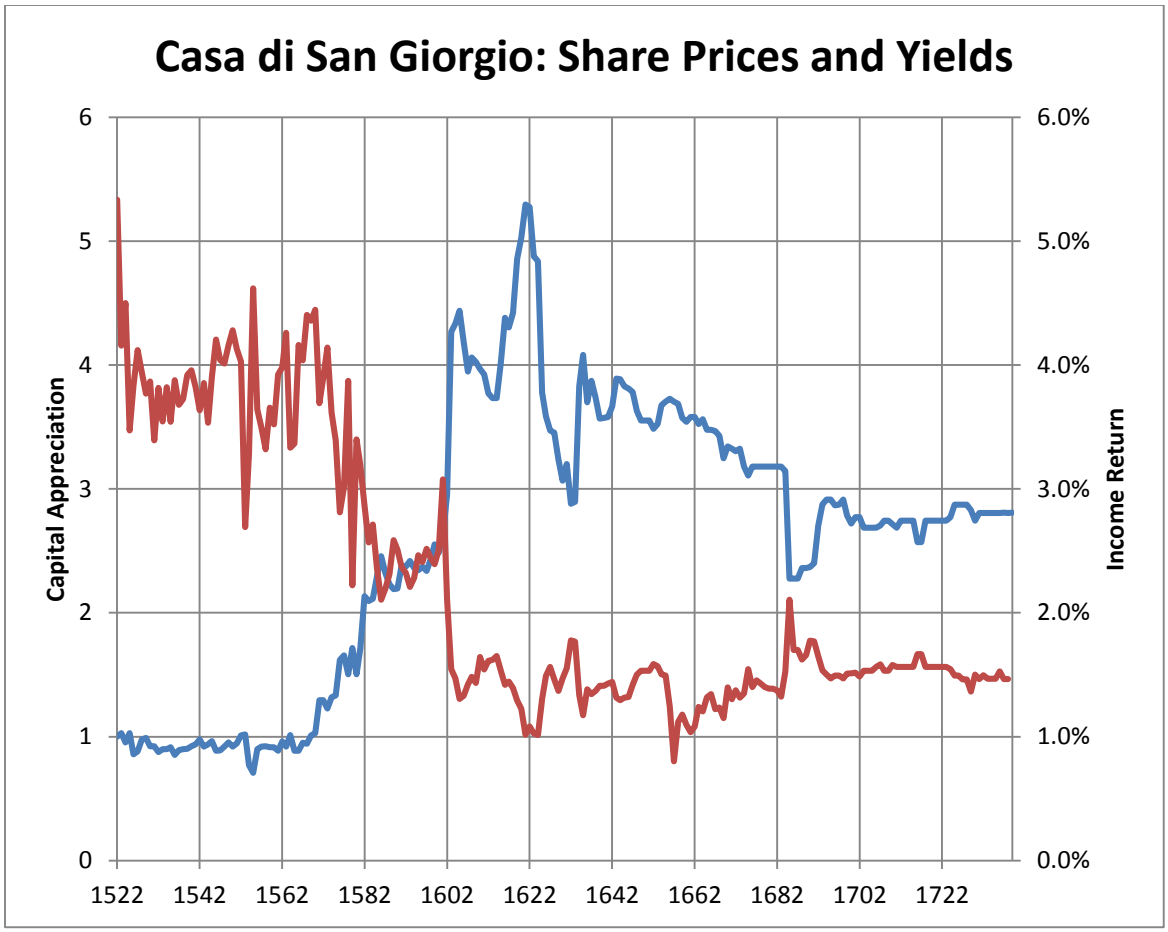
Casa di San Giorgio: Share Prices and Yields
Capital Appreciation
Income Return
6
5
4
3
2
1
0
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
1522
1542
1562
1582
1602
1622
1642
1662
1682
1702
1722

Figure 1

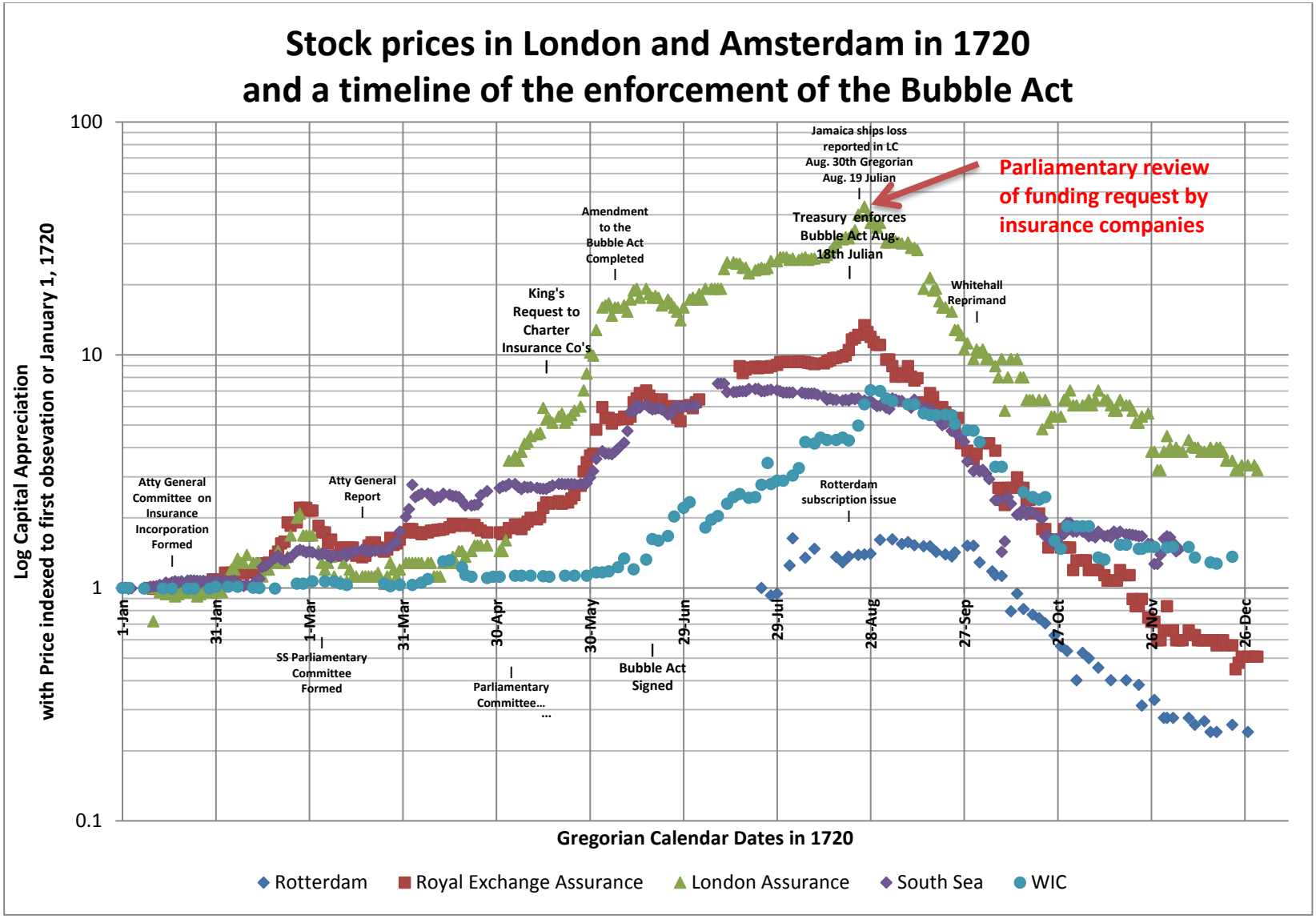
Stock prices in London and Amsterdam in 1720
and a timeline of the enforcement of the Bubble Act
Log Capital Appreciation
with Price indexed to first obsevation or January 1, 1720
100
10
1
0.1
Gregorian Calendar Dates in 1720
1-Jan
31-Jan
1-Mar
31-Mar
30-Apr
30-May
29-Jun
29-Jul
28-Aug
27-Sep
27-Oct
26-Nov
26-Dec
Atty General Committee on Insurance Incorporation Formed
Atty General Report
SS Parliamentary Committee Formed
Parliamentary Committee...
...
King's Request to Charter Insurance Co's
Amendment to the Bubble Act Completed
Bubble Act Signed
Jamaica ships loss reported in LC Aug. 30th Gregorian Aug. 19 Julian
Treasury enforces Bubble Act Aug. 18th Julian
Rotterdam subscription issue
Whitehall Reprimand
Parliamentary review of funding request by insurance companies
Rotterdam
Royal Exchange Assurance
London Assurance
South Sea
WIC

Figure 2

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