# Venture Capital and the Economics of Innovation

Lecture 5

The Banality and Necessity of Bubbles

# Profiles of Two Bubbles
# New York: 1929 and 1999

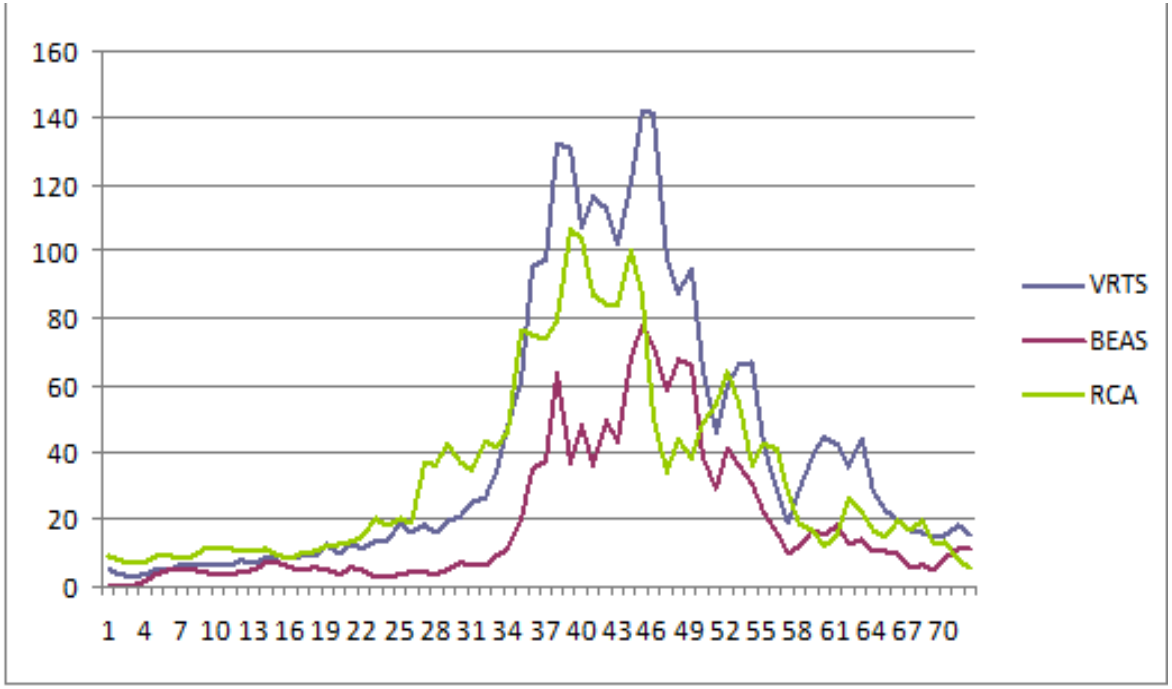
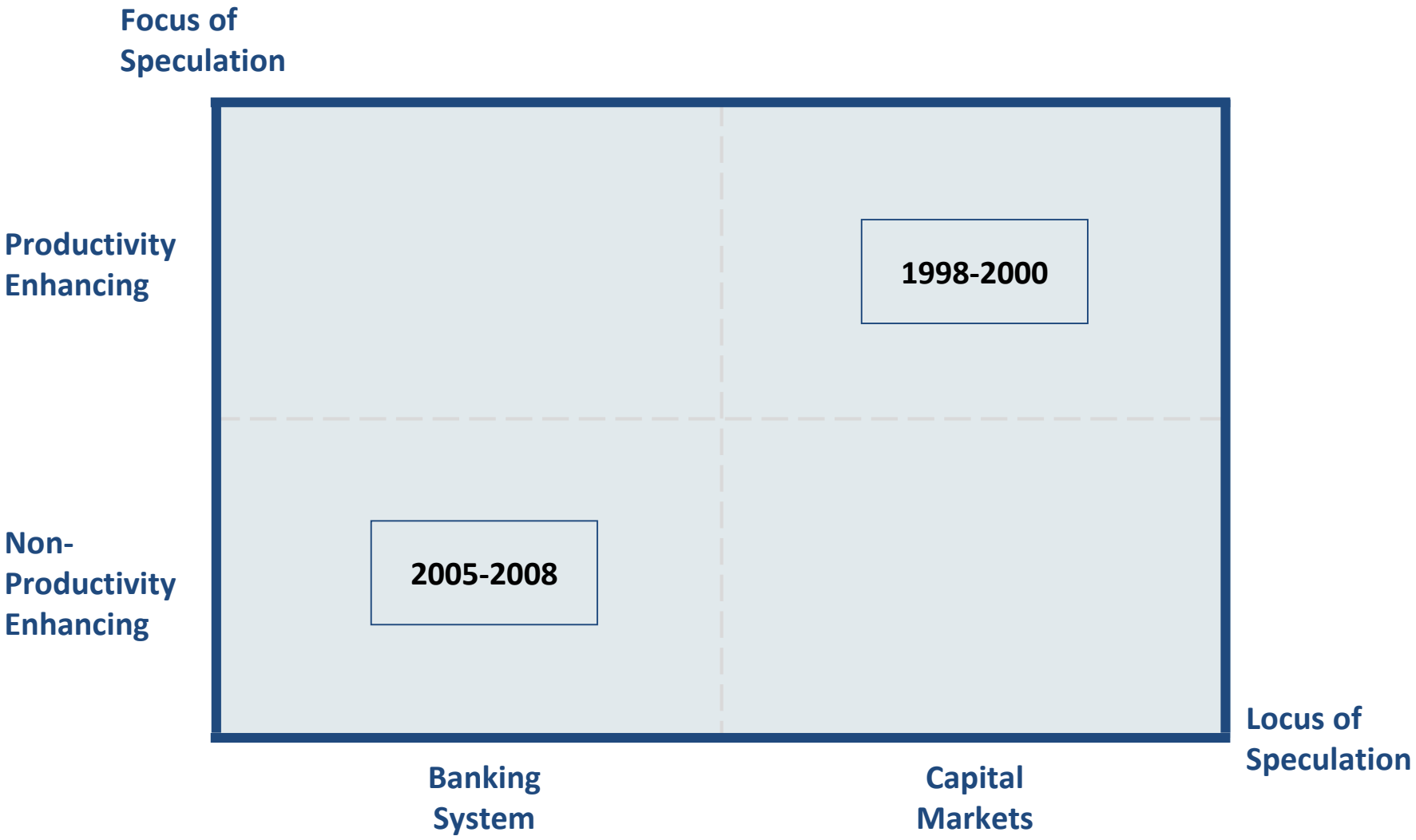



*Figure 7.1.* Stock prices for RCA, 1926–1932; VERITAS Software, 1997–2003; and BEA Systems, 1997–2003.

# Bubbles: A Typology



# The Role of Leverage

"…[S]ome bubbles matter more than others. **What makes bubbles dangerous is the role of credit**…. Pure, unleveraged "irrational exuberance" bubbles may pose a limited threat to financial stability or the macroeconomic outlook. **"Credit boom bubbles," on the other hand, may be a dangerous combination. In such bubbles, a positive feedback develops that involves credit growth, asset prices, and increasing leverage**….

"**In recent years, central banks typically ignored credit and stayed on the sideline when asset price bubbles inflated…. The critical assumption was that central banks would be in a position to manage the macroeconomic fall-out**. They could clean-up after the mess. While the aftermath of the dotcom bubble seemed to offer support for this rosy view of central bank capabilities, the 2008 Global Financial Crisis dealt a severe blow to the assumption that the fall-out of asset price bubbles was always and everywhere a manageable phenomenon. **Although these observations are based on just two data points from recent history, they mesh well with the key finding of this paper: not all bubbles are created equal**."

(O. Jorda, Schularik, M. and Taylor, A. M., "Leveraged Bubbles," (NBER Working Paper 21486, August 2015) pp. 2, 31)

# Focus of Speculation

"Investors have speculated in commodity exports, commodity imports, agricultural land at home and abroad, urban building sites, railroads, new banks, discount houses, stocks, bonds (both foreign and domestic), glamour stocks, conglomerates, condominiums, shopping centers and office buildings."

(Kindleberger and Aliber, *Manias, Panics and Crashes: A History of Financial Crises,* 6th edn. (New York: Palgrave Macmillan, 2011) p. 15)

# London's First Bubble

"[T]he mid-1690s witnessed the launch of some one hundred new joint stock companies, enterprises whose ownership was represented by more or less freely transferable equity securities. Their shares offered outlets for speculative investment to those who could not gain access to the shares of the few established monopolies, first among which was the East India Company, dating from the reign of England's James I. The purposes of the stock promotions ranged from the recovery of shipwrecks in search of treasure to the seemingly more mundane manufacture of linen. In the former instance, a 'projector' absconded with the funds provided by Daniel Defoe and others; in the latter, the incompetence of its founders forced the Linen Company to purchase for resale at a loss goods it did not itself know how to produce.

"The London stock market boom of the mid-1690s was accompanied by a proliferation of equity derivatives, notably put and call options, which respectively carried the right—but not the obligation—to sell or buy shares at an agreed price for an agreed period of time. This was not the first and would not be the last time that a speculative wave was accompanied by financial innovations: tulip bulb futures had been traded in Amsterdam in the 1630s. As at other times, the derivatives could equally be employed to leverage opportunity for gain as to manage risk of loss.

(Janeway, *Doing Capitalism, 2nd ed., pp.* 157-8, citing A. L. Murphy, *The Origins of English Financial Markets: Investment and Speculation before the South Sea Bubble,* p. 31)

# South Sea Bubble

"**The most significant attribute of the South Sea Bubble was the extraordinarily wide range of projects that served as the objects of speculation, amplifying the phenomenon of the 1690s**. Writing from hearsay some 120 years later, Charles Mackay compiled a list of 86 "bubble companies" that were declared illegal in 1720, ranging from straightforward proposals for "the importation of Swedish iron" and for "making glass bottles" to more grand, even grandiose, schemes for "paving the streets of London" and "furnishing funerals to any part of Great Britain." **Of course, Mackay includes the iconic—and now generally deemed apocryphal—project: "For carrying on an undertaking of great advantage, but nobody to know what it is."** To my mind**, this enormous range of speculative projects carries the most important historical lesson and analytical challenge: anything, it appears, can be the object of speculation**, whether that speculation is expressed through the lending of capital for projects with minimal likelihood of generating cash sufficient for repayment or through the purchase of shares at valuations impossible to relate to the cash flow fundamentals of the economic assets they represent."

Janeway, *Doing Capitalism*, 2nd ed., pp. 160-1, citing C. Mackay, *Extraordinary Popular Delusions*, pp. 50–58)

# Bubble of 1825

"**The military successes of the revolting Spanish American colonies stimulated offerings of government bonds from the new Latin American states as well, followed by stocks in newly privatized mines. Many more gasworks were listed as every community in England rushed to provide its residents and businesses the gas lighting that was proving so successful in London. A number of insurance companies were created...**

"**But the most attractive assets offered were those from Latin America**. The collapse of Spanish control over its American empire during the Napoleonic Wars led to a variety of independent states being formed out of the former colonies by 1820. Battling one another for control over strategic transport routes, mainly rivers and ports, and over state enterprises, mainly mines, each appealed to foreign investors as a source of government finance and as a means to substitute foreign expertise and technology for the vanquished Spanish. Their government bonds and their mining shares found a ready market in the London Stock Exchange, which had become the dominant marketplace for finance capital in the world during the Napoleonic Wars. **The loan bubble of 1822-25 ensued, eventually giving British foreign-bond holders their first experience with defaults by sovereign states**."

(L. Neal, "Financial Crisis of 1825, *Federal Reserve Bank of St. Louis Review,* May/June 1998,pp. 61-2)

# The First Genuinely Productive Bubble


Source: A. Odlyzko, "Collective hallucinations and inefficient markets: The British Railway Mania of the 1840s," available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1537338

# Financing the American Railroads: A Second Productive Bubble

"**The demands of the railroads during the 1850s on American financial intermediaries and on construction contractors were unprecedented**. Railroads required far larger amounts of capital to build than did canals. The total expenditures for canals between 1815 and 1860 reached $188 million, of which 73 percent was supplied by state and local governments….**By 1859 the investment in the securities of private railroad corporations had passed the $1,100 million mark, and of this amount close to $700 million had been raised in the previous ten years**….

"As soon as the American capital market became centralized and institutionalized in New York City, all the present-day instruments of finance were perfected; so too were nearly all the techniques of modern securities marketing and speculation….

"**By the outbreak of the Civil War, the New York financial district, by responding to the needs of railroad financing, had become one of the largest and most sophisticated capital markets in the world**…"

(A. D. Chandler, *The Visible Hand: The Managerial Revolution in American* Business (Cambridge MA: Harvard University Press, 1977) pp. 90-2)

# London: 1863-4

"…[A] major bull market, in which **almost 700 new companies were registered and the City was awash with speculative froth**. The new finance houses were not helped by the fact that during the year after their launch there took place . . . a wave of company promotions so relentlessly opportunistic as to darken the name of *any* new financial concern. "Most unblushing have been the appropriations made for services in the establishment of banks," declared Morier Evans in his aptly named *Speculative Notes* (1864), asserting that **"the amount of transparent jobbery almost recognized in the light of day, has exceeded that known to have existed in the great bubble period of 1824–25, or the later railway mania of 1845."**

(Kynaston, *A World of Its Own: 1815–1890,* vol. I of *The City of London,* 4 vols. (London: Pimlico, 1995), p. 220)

# London: 1871

"**Only seven years later, one of the financial entrepreneurs of 1863–1864 led another feverish bull market. Albert Grant (formerly Albert Gottheimer), [whom Kynaston identifies as] "the real-life Melmotte" of Trollope's *The Way We Live Now*—that definitive rendering of the culture of speculative excess—himself summarized the spectacle**. The year 1871, he wrote, 'was a year and an era when everyone was seeking what he could make on the Stock Exchange. There is a peculiar fascination to some people in making money on the Stock Exchange. **I know hundreds who would rather make £50 on the Stock Exchange than £250 by the exercise of their profession**; there is a nameless fascination, and in the year 1871 the favorite form of making money on the Stock Exchange was by applying for shares, selling them at whatever premium they were at, and the money was considered made—I say considered honourably made.'"

(Kynaston, *A World of Its Own,* p. 266)

# The "Brush Boom": 1882

"**There was such a rush for the shares as had never been seen before in Lombard Street**, the whole street being blocked by the crowd pressing to get to the bank to pay in their applications . . . The capital was enormously oversubscribed, all the well known City names amongst the list of subscribers, **and the shares, which on allotment were to be £3 paid, were on the day of the prospectus dealt on the London Stock Exchange at £7 per share, or £4 premium**." (Kynaston, *A World of Its Own*, p. 341)

"**A year after the bright promise of the spring of '82, the Anglo-American Brush Company stood revealed as a patent-holding and manufacturing company which had been founded on an arc-lighting system that was no longer outstanding in its field and on an incandescent-lamp patent of doubtful value**."

(T. P. Hughes, *Networks of Power: Electrification in Western Society 1880-1930* (Baltimore MD: The Johns Hopkins University Press, 1993) p. 62*)*

# The "Kaffir Boom": 1886-1894

"**The discovery of gold on the Witwatersrand in South Africa generated the first wave of the "Kaffir Circus" on the floor of the London Stock Exchange**, as brokers fought with each other for access. Kynaston takes note of "an adage, beloved of the Stock Exchange [that] dates from about this time: 'a mine is a hole in the ground owned by a liar.'" In reality, the great South African gold boom had legs, although it had to wait for convincing evidence that innovative mining technology could open up the deep mines and that cyanide could be used to extract gold from pyretic ore. When the market did become convinced in late 1894, the boom that followed "became one of those phases of City history that almost ranked with the South Sea Bubble in terms of mythological status." The value of annual production on the Rand rose 50 percent, from £5.18 million to £7.84 million, and the net British purchase of shares to fund the increase is estimated at some £40 million. **So great was the volume of trading that it spilled out from the floor of the Stock Exchange and continued after hours. When in March 1895 the police attempted to clear the area, the Battle of Throgmorton Street erupted as the brokers refused to suspend their dealing and move on."**

(Janeway, *Doing Capitalism 2nd ed.*, p. 147, citing Kynaston, *Golden Years: 1890–1914,* vol. II of *The City of London,* 4 vols. (London: Pimlico, 1995), p. 109.)

# The London Stock Exchange and Innovation

"**Did it matter that by far the most important financial intermediary in the early history of the British motor-car industry was a crook? The answer is surely yes**, for quite apart from the specific matter of the shortages of working capital adversely affecting pioneer producers such as Daimler, the Lawson saga marked the beginning of what would be an uneasy, mutually mistrustful relationship between that industry and the City. The industry, not unnaturally, feared being ripped off again; the City, just as naturally, perceived the industry was full of unprofitable "lemons" and was reluctant to subscribe or encourage the subscription of further capital. **The analogy with the electrical industry, following the catastrophic "Brush Boom" of the early 1880s, is painfully obvious.**"

(D. Kynaston, *A World of Its Own: 1815–1890,* vol. I of *The City of London,* 4 vols. (London: Pimlico, 1995), p. 148.)

# The Auto Industry and the Stock Market: The Boom of 1915-17

"…[N]**early fifty security issues were undertaken by automobile companies from 1915 to 1917** to raise cash of more than $100 million in new financings. Some of these issues were undertaken by the larger, established companies in the industry….In addition, **a group of recent entrants to the automobile business, twenty of them in total, raised funds from the financial markets at this time**.

"…[T]hese companies were late entrants…, and the majority of them came to a sorry end. **By 1924, thirteen out of twenty of them had exited the automobile industry….However, there were six survivors, including Chevrolet**…."

(M. O'Sullivan, "Funding New Industries: A Historical Perspective on the Financing Role of the US Stock Market in the Twentieth Century," in N. Lamoreaux and Sokoloff, K., *Financing Innovation in the United States: 1870 to the Present* (Cambridge MA: MIT Press, 2007), pp. 180-1)

# Aviation and the Stock Market

"…Initially, the public did not seem particularly interested in investing in the aviation industry….

"**Charles Lindbergh's transatlantic flight in May 1927 changed all of that**…At the time, however, there were few…stocks from which investors could choose. **Wright Aeronautical was the only aviation company with a listing on the NYSE. It made the engine that powered Lindbergh's plane, and its stock soared from 25…in April 1927 to 94 ¾ by December 1927**.

"…**From March 1928 to June 1930, 124 public offering of stock were conducted by aviation companies to raise more than $300 million**…."

(O'Sullivan, p. 187)

# Radio and the Stock Market: The First Boom

"…**The boon to the commercial potential of radio…was the development of public broadcasting in 1920**.

"By far the most important player in the radio industry…was the **Radio Corporation of America**. It was established at the initiative of General Electric, with **the approval of the U.S. government**, to bring all the important patents in the U.S. radio industry…under one roof.

"The wave of entry into the radio industry was accompanied by **a boom in stock issues of radio companies**. An expression commonly heard at the time was 'a new radio stock a day'….

"The stock market's enthusiasm for the radio industry dissipated in early 1925 largely because of the pressure on profitability that high entry had caused. The leading radio stocks lost 60 percent of their value from December 1924 to May 1926. If we exclude RCA…the decline…was…92 percent."

(O'Sullivan, pp. 193-5)

# Radio and the Stock Market: The Second Boom

"Following the crash of radio stocks in 1925, there was a lull…that lasted for almost three years….**From Match 1928 to September 1929, twenty-five public stock offerings were undertaken by radio companies to raise a total of $38.4 million**.

"There was another bust in radio stock prices from 1929. The stock market crash and subsequent depression played crucial roles in precipitating the decline, but industry observers also blamed another overexpansion of the industry.'

(O'Sullivan, p. 196)

# Financing Electrification

"During the 1920s, **the public equity and debt markets played the critical role in funding the build-out of the systems** that delivered electricity to industry and to households, regionally and at length nationally. The public utility holding companies, initially created to transfer technical expertise to local generating and distribution companies, evolved into vehicles for providing the necessary finance for an industry whose capital intensity rivaled that of the railroads.

"So **electrification evolved through a dynamic feedback process that delivered, generally at the state and local level, both speculative capital and governmental regulation, the latter invoked to protect the prospective returns on the former**....As the level of electrification for manufacturing industry and (nonrural) residential uses passed 50 percent in the early 1920s, consolidation of the industry into regional and even national holding companies was enabled by a frenzy on Wall Street terminated only by the Crash of 1929. **Before the frenzy ended, installed generating capacity in the United States had risen from 13 million to 33 million kilowatts**."

(Janeway, *Doing Capitalism*, 2nd ed., p. 227)

# The Great US Bull Market of the 1920s

**"…[T]he cash proceeds from stock issues in the United States…were already relatively high by the early part of the twentieth century, and the rapid growth that occurred in the 1920s brought them to an impressive peak by 1930**. However, stock issues collapsed in the early 1930s….Although there was a recovery in 1936 and 1937, it proved temporary, as wartime led to another decline….However, the postwar period, especially from the late 1940s, was marked by a fairly steady upward trend in the proceeds from stock issues. It culminated in the 1980s and 1990s when the real proceeds from stock issues reached their highest levels for the entire century.

"However,…if we take account of the growth in the U.S. economy, it is the 1920s that stands out as the decade with the highest level of stock issuance. **No other year before or after came close to 1928 and 1929 in the levels of stock issuance as a percentage of national income**…."

(O'Sullivan, pp. 167 and Tables 4.1 and 4.2)

# Keynes on 1925-1929: A Productive Bubble

"While some part of the investment which was going on in the world at large was doubtless ill judged and unfruitful, **there can, I think, be no doubt that the world was enormously enriched by the constructions of the quinquennium from 1925 to 1929**; its wealth increased in these five years by as much as in any other ten or twenty years of its history. **The expansion centred round building, the electrification of the world, and the associated enterprises of roads and motor cars**. In those five years an appreciable change was effected in the housing, the power plant, and the transport system of a large part of the world. But it was not unduly specialised. Almost every department of capital development took its share. **The capacity of the world to produce most of the staple foodstuffs and raw materials was greatly expanded; machinery and new techniques directed by science greatly increased the output of all the metals, rubber, sugar, the chief cereals, etc**.

(J. M. Keynes, "An Economic Analysis of Unemployment," *Collected Writings*, vol. XII, p. 347)

# The "-onics" Bubble: The Return of Speculation *circa 1960*

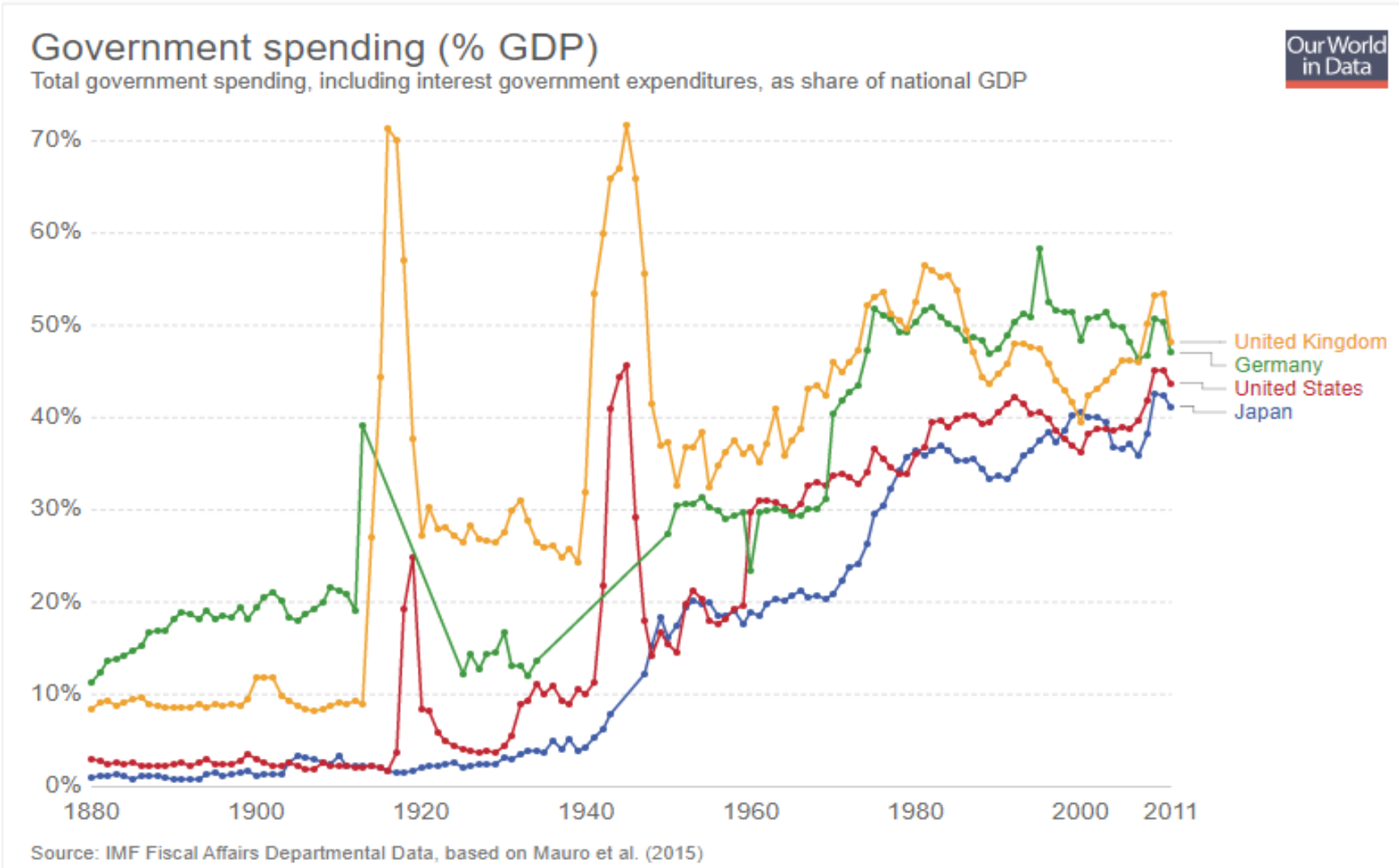
"The bull market that got underway from the early 1950s was primarily focused on the stocks of established companies….

"It was **not until the late 1950s that substantial numbers of small, high-tech companies once again sold stock to the public**. An important catalyst for the change occurred in October 1957….***Sputnik* galvanized the U.S. political elite to make even greater financial commitments to the development of technology**….

"A boom in initial public offerings got underway in 1958 and continued until the decline of the stock market in early 1962. During this period, as the SEC put it, 'The distribution of securities by companies that had not made a previous public offering reached the highest level in history.'"

(O'Sullivan, p. 208)

# Public Sector Share of National Economy



# The Super-Bubble of 1982-2008: The Role of Big Government - 1

"…**the different impacts of government deficits** on our economy: the ***income and employment effect***, which operates through government demand for goods, services, and labor; the ***budget effect***, which operates through generating sectoral [cash flow] surpluses and deficits; and the ***portfolio effect***, which exists because the financial instruments out to finance a deficit must appear in some portfolio….

"**The effect of Big Government on the economy is much more powerful and pervasive than is allowed by the standard view** which neglects the financial-flow and portfolio implications of a government deficit. The standard view focuses solely on the direct and secondary effects of government spending . . . on aggregate demand. The expanded view allows both for the cash flows that other sectors need in order to fulfill commitments and for the need for secure assets in portfolios in the aftermath of a financial disturbance."

(Minsky, *Stabilizing an Unstable Economy*, (New Haven CT: Yale University Press, 1986), p. 21)

# The Super-Bubble of 1982-2008: The Role of Big Government - 2

"**What made the super-bubble so peculiar was the role that financial crises played in making it grow**. Since the belief that markets could be safely left to their own devises was false, the super-bubble gave rise to a series of financial crises. . . . **Each time a financial crisis occurred, the authorities intervened**, merged away or otherwise took care of the failing financial institutions, and applied monetary and fiscal stimuli to protect the economy. These measures reinforced the prevailing trend of ever increasing credit and leverage, but as long as they worked, they also reinforced the prevailing misconception that markets can be safely left to their own devices**. It was the intervention of the authorities that saved the system; nonetheless these crises served as successful tests of a false belief, and, as such, they inflated the super-bubble even further**."

(Soros, *Lectures at the Central European University* (New York: Public Affairs, 2010) p. 39)

# The Super-Bubble of 1982-2008: The Role of Finance Theory

"**Finance Theory has become incorporated into the infrastructure of financial markets in at least three ways: technical, linguistic and legitimatory**….. [**Technically**:] derivatives-pricing models implemented in software give large players in the derivatives market, notably investment banks, the ability mathematically to analyze and decompose the risks involved in their portfolios, and this is vital for their capacity to operate on a large scale in this market…. [**Linguistically**:] the theory offers a way of talking about markets, especially about markets whose complexity might otherwise be baffling….[**In terms of legitimacy**:] To say of a financial market that it is "efficient"—that its prices incorporate, nearly instantaneously, all available price-relevant information—is to say something commendatory about it, and that has been what orthodox financial economics has said about the central capital markets of the advanced industrial world . . . Derivatives were haunted by the impression, held not only by lay-people but by many market-regulators, that they were simply wagers on the movement of prices . . . **Economists helped make the financial derivatives markets possible by providing initial legitimacy**."

(D. MacKenzie, *An Engine Not a Camera: How Financial Models Shape Markets* (Cambridge, MA: MIT Press, 2008) pp. 250-2)

# The Super-Bubble or 1982-2008: The Role of IT

"**Finally, the impact of modern finance theory on modern finance practice would never have been realized except for the IT revolution**. In no sector of the world economy did advances in computing have a more revolutionary effect than in finance. Here was a world peopled by smart, rich and intensely competitive players who were swimming in oceans of data. The trading desks rapidly moved beyond deploying computers merely to transact and record the growing volume of trades on the stock exchange. Traders mobilized computers to analyze data in order both to identify opportunities for profitable arbitrage and to create new instruments for trading, from swaps of currency and interest payments, to instantaneously updated stock indices, to asset-backed securities of all sorts, beginning with mortgages and extending to credit card receivables and student loans.

"...**By making it possible to transform credit instruments that had traditionally been bought and held by lenders into tradable securities, computerization enabled the extension of the originate-and-distribute model from the equity and bond markets across the entire spectrum of credit, even as it also offered the false promise of constructing insurance against loss**."

(Janeway, *Doing Capitalism* 2nd ed., p. 165*)*

# The Tech Bubble of the Late 1990s

"**From 1994 to 2004, there was a dramatic boom, and subsequent decline, in R&D: The ratio of privately financed industrial R&D to GDP rose from 1.40% in 1994 to an all-time high of 1.89% in 2000 before declining to an average of 1.70% from 2002 to 2004**, according to a survey from the National Science Foundation. As we will show, just seven high-tech industries (drugs,office equipment and computers, electronic components, communication equipment, scientific instruments, medical instruments, and software) accounted for virtually all of the 1990s U.S. R&D boom. More important, **virtually all of the boom was accounted for by young firms (publicly traded for less than 15 years) in these industries.**

"**From 1994 to 2004, there was also a dramatic boom and bust in both cash flow and external equity finance in these industries**. Internal finance (cash flow) for publicly traded firms increased from $89 billion in 1993 to $231 billion in 2000, and then collapsed in 2001 and 2002. External public equity finance rose from $24 billion in 1998 to $86 billion in 2000, but then plummeted 62% in 2001."

(J. R. Brown, Fazzari, S. M. and Peterson, B.C., "Financing Innovation and Growth: External Equity and the 1990s R&D Boom," *Journal of Finance*, 64(1) 2009, p. 152)

# The Tech Bubble: Financing R&D

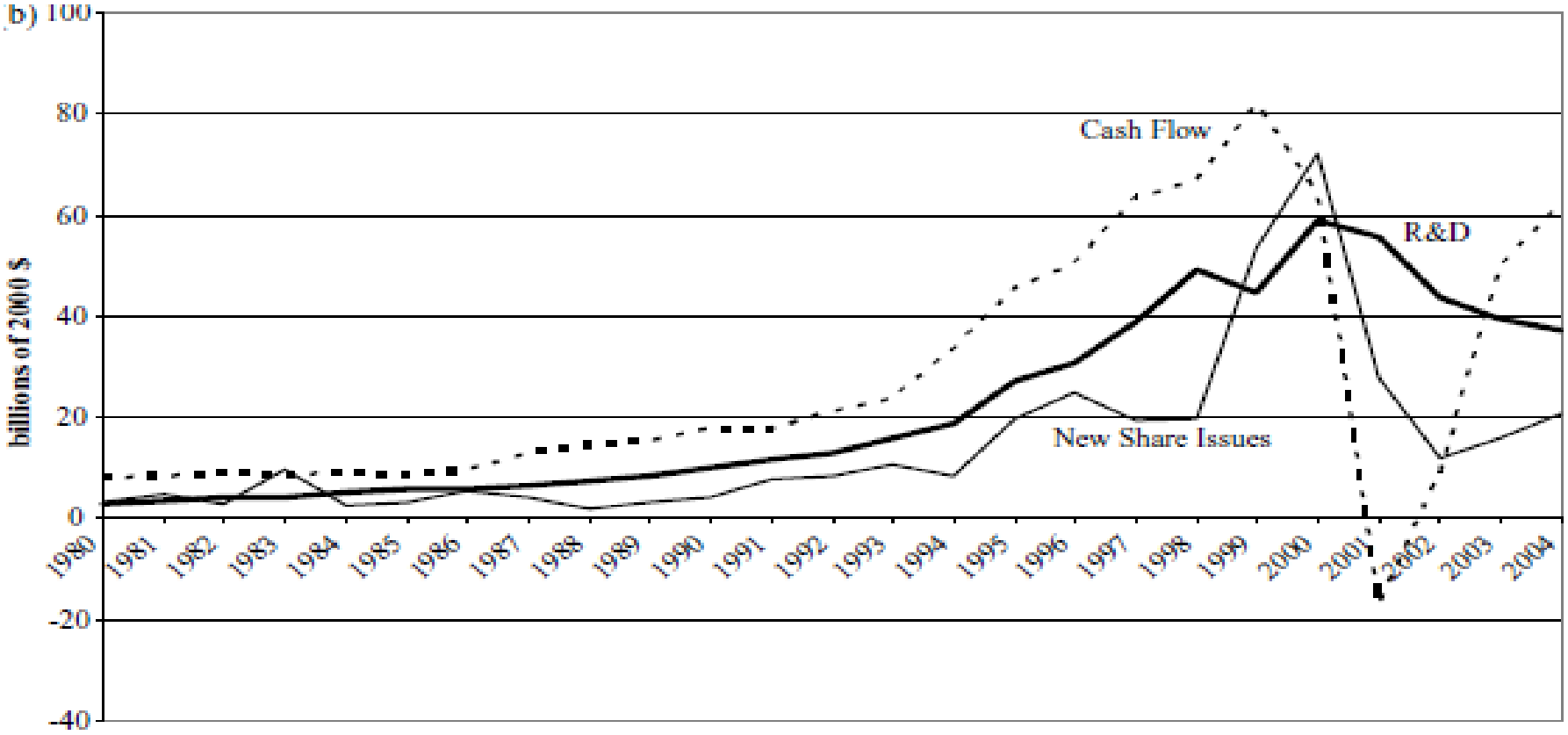



**Figure 2b. High-tech R&D, cash flow, and new share issues (young firms).** The sample is all young high-tech firms with coverage in Compustat. A firm is classified as young for the first 15 years following the year it first appears in Compustat with a stock price. The high-tech industries are SICs 283, 357, 366, 367, 382, 384, and 737. The heavy line plots the sum of R&D for all young high-tech firms, the dashed line plots the sum of gross cash flow, and the thin line plots the sum of net new stock issues with negative net issues set equal to zero.

# Bagehot's Version

"**The history of the trade cycle had taught me that a period of a low rate of return on investments inexorably leads towards irresponsible investment** … People won't take 2 per cent and cannot bear a loss of income. Instead, they invest their careful savings in something impossible – a canal to Kamchatka, a railway to Watchet, a plan for animating the Dead Sea."

# Entrepreneurs and Speculators: Financial Valuation and Real Investment

"**By conveying a positive signal about profitability, higher aggregate investment . . . increases asset prices, which in turn raises the incentives to invest**. This two-way feedback between real and financial activity makes economic decisions sensitive to higher-order expectations and amplifies the impact of noise on equilibrium outcomes. As a result, economic agents may behave **as if** they were engaged in a Keynesian "beauty contest" and the economy may exhibit fluctuations that may appear in the eyes of an external observer **as if** they were the product of "irrational exuberance." Importantly, these effects are symptoms of inefficiency, are driven purely by the dispersion of information, and obtain in an otherwise conventional neoclassical setting."

(M. Angelotos, Lorenzoni, G. and Pavan, A., "Beauty Contests and Irrational Exuberance," NBER Working Paper 15883 (2010), pp. 31–2.)

# Financial Valuation and Real Investment through the Cycle

"**The effects analyzed in this paper are likely to be stronger during periods of intense technological or institutional change, when the information about the profitability of new investment opportunities is likely to be highly dispersed**. At some level, this seems consistent with the recent experiences surrounding the internet revolution or the explosion of investment opportunities in emerging economies. Our mechanism may, however, also be relevant for ordinary cyclical fluctuations. Indeed, information regarding aggregate supply and demand conditions seems to be widely dispersed, as indicated by surveys of forecasts and by the financial markets' anxiety preceding the release of key macroeconomic statistics. This opens the door to the possibility that effects similar to the ones documented in this paper may operate over the business cycle." (Angelotos, et. al., p. 32)

# Financing Risk for Startups

"**[A] particular feature of innovative startups is that they don't know how much investment will be required to get to the `finish line'. Intermediate results may be equivocal, or additional investments may be required to get to cash flow positive**. Any investor in such startups with limited resources must therefore also rely on other investors to bring innovative firms to fruition. Because of this, such startups face two risks - fundamental risk (that the project gets an investment but turns out not to be viable) and **financing risk (that the project needs more money to proceed but cannot get the financing even if it is fundamentally sound)**. Financing risk is typically ignored in the literature because all firms with positive fundamental NPV are assumed to get funded. This ignores the fact that **investing requires coordination across time between investors with limited resources. Investors must, therefore, forecast the probability that other investors will be there to fund the firm in the future**…."

(R. Nanda and Rhodes-Kropf, M., "Financing Risk and Innovation," Harvard Working Paper 11-013 (2010), pp. 37-8)

# Breaking the "No-Invest Equilibrium"

"**In June 1992, Warburg Pincus ... launched OpenVision Technologies with a commitment to fund up to $25 million on terms agreed in advance**….

"The structure was an innovation, constructed in direct contrast to the traditional venture capital funding model of multiple rounds of investments with multiple firms investing per round....

"The **standard model had multiple flaws** relative to the strategy we were adopting. Designed to fund the development and commercial launch of a new product, an essentially linear process, **it mapped poorly to a hybrid strategy that contemplated opportunistic acquisitions from the start**. From management's point of view**, the ability to execute such a strategy would be radically compromised if every initiative had to wait on a successful exercise in incremental fund-raising**…In today's environment, …the relevance of a venture strategy whose focus is the achievement of positive cash flow at the earliest possible date is obvious.

"**Warburg Pincus had the cash to fund a venture such as OpenVision, but it only made sense to do so if we had unequivocal control. Delivery of funds under our commitment had to be entirely at our discretion**..... "

(Janeway, *Doing Capitalism*, 2nd. Ed., pp. 120-1)

# Hot Markets and Cool Stuff: Theory - 1

"**Our model also implies that some extremely novel but NPV positive technologies or projects may in fact need `hot' financial markets to get through the initial period of discovery or diffusion, because otherwise the financing risk for them is too extreme**. This provides a more positive interpretation to peaks of financial activity and may also explain the historical link between the initial diffusion of many novel technologies (e.g. canals, railways, telephones, motor cars, internet, clean technology) being associated with heated financial market activity (Perez (2002)). This implies that regulators should not always be concerned with popping `bubbles', and furthermore, that **those wishing to stimulate innovation should look for ways to concentrate investment in a sector or time or location in order to help create the coordination among investors that creates or magnifies innovation**."

(R. Nanda and Rhodes-Kropf, M., "Financing Risk and Innovation," p. 6)

# Hot Markets and Cool Stuff: Theory - 2

"By modeling the investor response to financing risk we are able to understand why financing risk is likely to create or magnify innovative activity, as well as lead investors to fund a different type of firm at different times in the innovation cycle. **Conventional wisdom on the effect of abundant financing is one of money chasing deals (Gompers and Lerner (2000) - that when more money enters an area more "bad", lower return, deals are funded. Our idea is that simultaneously money changes deals**. That is, **when capital is abundant, more innovative ideas are funded** because financing risk falls in these times, increasing the NPV of innovative projects. Thus, during peaks of activity financiers may increase experimentation and fund a fundamentally different type of activity." (Nanda and Rhodes-Kropf, "Financing Risk," p. 4)

# Hot Markets and Cool Stuff: Empirics

"We find that startups receiving their initial funding in more active investment periods were significantly more likely to go bankrupt than those founded in periods when fewer startup firms were funded. However, conditional on being successful, and controlling for the year they exit, startups funded in more active periods were valued higher at IPO or acquisition, led more patents in the years subsequent to their funding (controlling for capital received), and had more highly-cited patents than startups funded in less active investment periods. That is, **startups funded in hot markets were more likely to be in the "tails" of the distribution of outcomes than startups funded in cold markets: they were both more likely to fail completely and more likely to be extremely successful and innovative**."

(R. Nanda, and Rhodes-Kropf, M., "Investment Cycles and Startup Innovation," *Journal of Finance,* 110(2), November 2013, *p*. 4)

# Market Overvaluation and Innovation

"**We find that overvaluation has a very strong and robust association with higher intangible investments and resulting outputs (R&D, patents, and patent citations**)….Furthermore, the sensitivity of R&D to misvaluation is about 4-8 times greater than the sensitivity of capital expenditures to misvaluation using either of our mispricing proxies….

"**One reason to expect misvaluation to be more important for innovative spending than for capital expenditures is that, under the misvaluation hypothesis, measured misvaluation should be most strongly related to the form of investment that investors are most prone to misval**uing. Intangible investments such as R&D have relatively uncertain payoff, and therefore are harder to value than ordinary capital expenditures…

"**Another reason why we expect misvaluation to have a stronger effect on innovative than routine expenditures is that industry- or market-wide overvaluation can help solve externality problems in innovation; a breakthrough by one firm can open opportunities for other firms**…."

(M. Dong, Hirshleifer D., Teoh, S. H., "Stock Market Overvaluation, Moon Shots and Corporate Innovation," NBER Working Paper 24142, July 2018, pp. 6-7.)

# Non-linear Effect of Overvaluation: Moonshots

"**We find that R&D spending, innovative output, and the three types of innovative inventiveness are more strongly positively associated with overvaluation among growth firms**....
"**Finally, we expect misvaluation effects on innovation to be non-linear**, with the strongest marginal effects on innovation occurring among the most overvalued firms. **Fixed costs of issuing equity, lumpy investment projects, within-firm knowledge spill-overs, and positive network externalities in innovation all imply convexity in the relation of innovative activities and outputs to misvaluation**.... Consistent with this hypothesis, **we find that R&D, innovative output, and inventiveness are far more sensitive to misvaluation in the top overvaluation quintile. For example, the effect of overvaluation on novelty, originality or scope is 4-7 times greater in the most overvalued quintile when compared with the effect in the full sample. In other words, extreme overvaluation is associated with 'moon shots'—projects that are exceptionally innovative**.

(Dong, et al., pp. 9-10)

# Amazon

"Amazon's IPO, on May 15, 1997…raised $54 million….(p. 59)

"…**In those highly carbonated years, from 1998 to early 2000, it raised a breathtaking $2.2 billion in three separate bond offerings**….(p, 69)

"While other dot-coms merged or perished, Amazon survived through a combination of conviction, improvisation and luck. **Early in 2000…Amazon sold $672 million in convertible bonds to overseas investors….The deal was completed just a month before the crash of the stock market**, after which it became exceedingly difficult for any company to raise money. **Without that cushion, Amazon would almost certainly have faced the prospect of insolvency over the course of the next year**." (p. 101)

(B. Stone, *The Everything Store: Jeff Bezos and the Age of Amazon* (New York: Little, Brown and Company, 2013)