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Is e-Commerce a Bubble?

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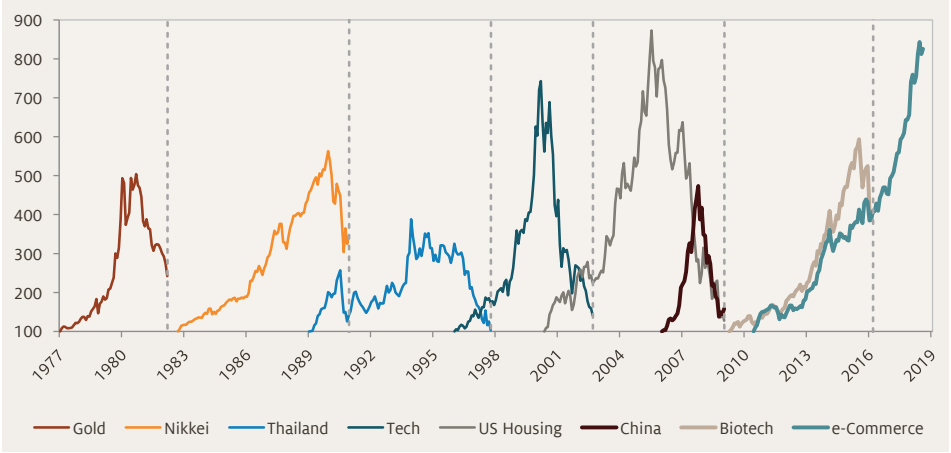
- The current hype about two-sided platforms, big data and "blitzscaling," featuring a growth over profits mentality, certainly raises the possibility that e-Commerce might be yet another bubble just waiting to be popped. Three arguments support this view:
  1. The breathtaking rise in the e-Commerce index has coincided with a massive increase in G4 central bank balance sheets. This is worrisome, as asset price bubbles inevitably depend on excessive credit growth.
  2. E-Commerce valuations certainly appear frothy. Their FCF (free cash flow) yield of only 2.0% is even lower than the tech sector's in the late-1990s.
  3. The process of creative destruction is getting faster and faster, yet many e-Commerce companies are taking longer and longer to become FCF positive. This insinuates a rising probability that they themselves will be prematurely disrupted, perhaps even before they are able to produce sufficient FCF to justify their lofty valuations.
- While these are solid arguments, and the e-Commerce index as a whole does appear stretched, we believe unequivocal bears miss two key points. First, that cheap changes everything. Digital technologies are much more powerful than their predecessors, because the inherently scalability massively lowers firms' marginal costs. The result is a seminal business model that is capable of producing an impressive win-win, with both companies and consumers becoming vastly better off.
- Second, cynics risk tarring all e-Commerce companies with the same brush. This would be a mistake, as we believe many companies in the sector do possess sound and promising business models. To accurately distinguish between the likely winners and losers, it is crucial to analyze each company based on its ability to produce FCF on a sustainable basis and on management's skills in capital allocation, including investing today for future value creation. These principles are as relevant to e-Commerce companies as they are to firms in more traditional sectors such as consumer staples or industrials.
- We outline a rigorous FCF approach that allows us to distinguish between good, indifferent and bad e-Commerce models. This framework is based on research by NYU's Aswath Damodaran, which he illustrates with three examples (Uber, Netflix and Amazon Prime). Damodaran's approach to valuation is similar to Epoch's in that it is focused on FCF generation and management's skills in capital allocation.

Vertiginous ascents: The e-Commerce index is up over eight times since mid-2010, exceeded only by U.S. homebuilders from 2000–2005. Each series below is indexed to begin at 100.

FIGURE 1: Is e-Commerce the 2nd Largest Bubble of the Last Four Decades?



Source: Bloomberg, DoubleLine, Bank of America, Epoch Investment Partners. As of July 31, 2018.
Note: We initially saw this chart in a webinar given by DoubleLine's CEO, Jeff Gundlach in June 2018. All eight series are indexed to begin at 100. Implying, for example, that e-Commerce is up over 8x from its base.

Global equity markets have been challenging, choppy and directionless so far this year. The MSCI ACWI is flat YTD and, in USD, the S&P 500 is the only major equity market squeaking out a positive return. Regardless, the U.S. tech sector has performed terrifically, up 16% so far, while the e-Commerce index[1] has hit it out of the ballpark, up an eye-popping 26%. Even more remarkable, they both enjoyed a stellar 2017, with tech up 36% and e-Commerce surging 43%. Given such returns, how nervous should we be about "irrational exuberance" and the prospect of a late-1990s style bubble?

I. This Time is Different (not)

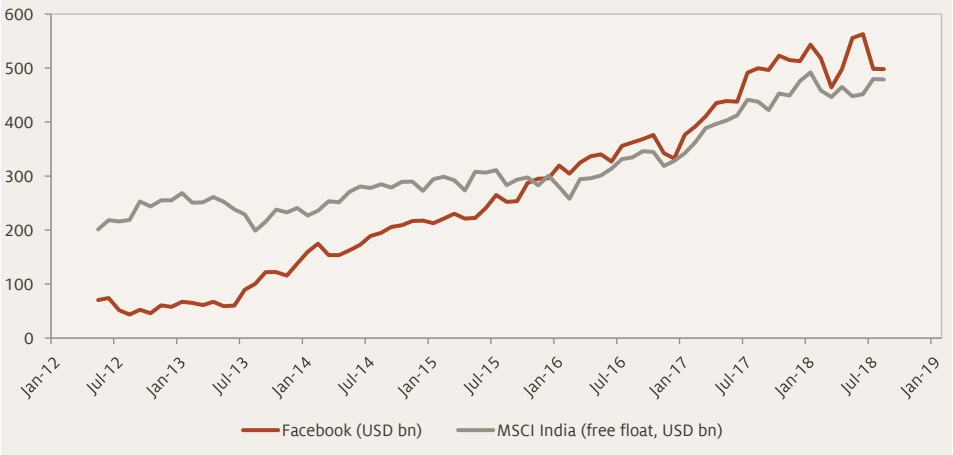
There have been (at least) seven clearly identifiable bubbles over the last forty years or so (**Figure 1**). The first bubble was gold, which peaked in 1980 at about 5x its initial price. The most recent candidate is e-Commerce, which is up over 8x since mid-2010. Although we are not convinced it's a bubble, we have to admit it shares a lot of the characteristics of one.

Bubbles always involve a dislocative event that promises to upend the existing order. This produces outsized gains for a number of years, and typically generates clever explanations for why traditional valuation metrics are inaccurate, inappropriate and irrelevant. This was certainly true of the Nikkei bubble in the late-1980s (Japan Inc. was going to take over the world, so a PER of 80x was totally reasonable) and tech's massive gains a decade later (a *Wall Street Journal* article suggested that investors "re-think" the "quaint idea" of profits). The current hype about two-sided platforms, big data and "blitzscaling," featuring a growth-over-profits mentality, certainly raises the possibility that e-Commerce might be yet another bubble just waiting to be popped.

While bubbles are easy to spot in retrospect, they can be challenging to identify conclusively and persuasively in real time. However, sometimes the associated anomalies are so jarring that investors just have to shake their

Such baffling discrepancies are the hallmark of many past bubbles.

FIGURE 2: The Market Cap of Facebook (30k employees) has Soared Past That for the Free Float of MSCI India (population 1.3 bn)



Source: Bloomberg, Epoch Investment Partners. As of August 31, 2018.

1. As represented by the 15 companies in the Dow Jones Internet Commerce index (includes Amazon, Google, PayPal, Facebook, Netflix, eBay, Expedia, GrubHub, Pandora and Groupon, among others).

head in disbelief. To illustrate, in the late-1980s, the real estate value of the Imperial Palace in Tokyo was thought to be worth more than the entire state of California, and the market cap of Japan's NTT exceeded that of the entire German equity market. However, neither of these incongruous situations lasted long. NTT's market cap subsequently stumbled and, by 1995, was worth less than one-quarter of Germany's market cap and today it is valued at less than one-twentieth.

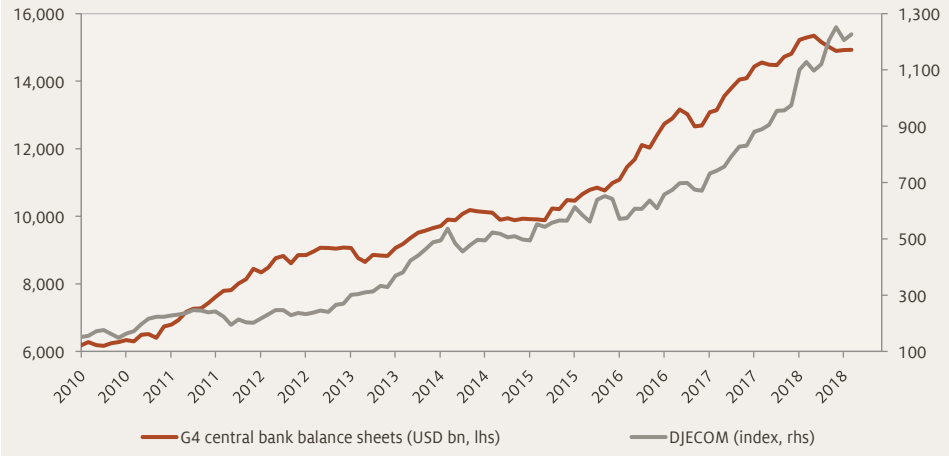
A comparable oddity exists today, with the free float market cap of the MSCI India index being eclipsed by that of Facebook (even taking into account its 21% decline since July 25).[2] Facebook is an admirable company in many ways, and has been consistently FCF generative since going public in 2012. Still, we find it difficult to wrap our mind around it being more valuable than all free floating shares in the second most populous country on the planet (**Figure 2**).

Credit supply and asset speculation: History doesn't repeat itself, but it often rhymes

Another reason to believe that e-Commerce might be a bubble is that its occurrence has coincided with a massive increase in G4 central bank balance sheets. Charles Kindleberger, who was the world's leading expert on financial crises, wrote that "asset price bubbles depend on the growth in credit."[3] While once a controversial idea, there is now substantial empirical and experimental evidence supporting the view that easier credit helps fuel asset prices through an increase in speculative buying. Thus, when credit conditions inevitably tighten, we will witness the return of price discovery.

The G4's unprecedented QE experiment has coincided with the surging e-Commerce index (correlation of 95.6%)

FIGURE 3: Asset Bubbles Inevitably Depend on Excessive Credit Growth



Source: Bloomberg, Epoch Investment Partners. As of August 31, 2018.

We have written extensively on this topic during the last year or so (Winds of Change), emphasizing how the expansion of QE has turbo-charged asset markets globally. E-Commerce represents just another instance of this effect (**Figure 3**), although it appears even more extreme than some of the other examples we have stressed (e.g., HY credit spreads and 10-year bund yields).

The e-Commerce index does appear frothy on a Free Cash Flow Yield basis

Often in bubbles, conventional valuation measures become stretched and untethered from fundamentals. Epoch has always preferred companies with business models that are capable of generating sustainable free cash flow, if not immediately then in the near future. We look for management teams to demonstrate that they are good capital allocators, investing today for future value creation.

On this basis, the e-Commerce index does appear both stretched and vulnerable. Five of the fifteen members of the index are FCF negative (including Amazon and Netflix); while a further five have a FCF yield of less than 2% (e.g. Google, TripAdvisor and GrubHub). This raises the real possibility that some of these companies possess business models that might never produce sufficient FCF to justify their lofty valuations.

By comparison, all but four of the seventy-two companies in the S&P 500's tech sector are FCF positive with a majority featuring a FCF yield of over 4%. Moreover, the tech sector is trading on a FCF yield that is only marginally

2. MSCI India here only includes the free float. If all shares were included then the market cap of India is just below that of Facebook plus Google. India's free float % is so low because either families or governments want to maintain control over many companies. Since 2002 the free float % has ranged between 30% and 38%, so we don't think this is going to change anytime soon. As a result, the free float is more meaningful than total market cap, as the other shares are likely to remain locked up and not be traded on public markets during our investment horizon.

3. Kindleberger and Aliber, "Manias, Panics and Crashes: A history of financial crises," (2005). Also see, Mian and Sufi, "Credit Supply and Housing Speculation," Princeton University and University of Chicago (2018).

below its post-1996 median (**Figure 4**). This provides a sharp contrast to the e-Commerce index which is trading on a very low FCF yield (currently 2.0%), which is even lower than the tech sector's in the late-1990s (averaged 2.1% from 1996-99). This suggests the e-Commerce index is at minimum frothy, if not in outright bubble territory.

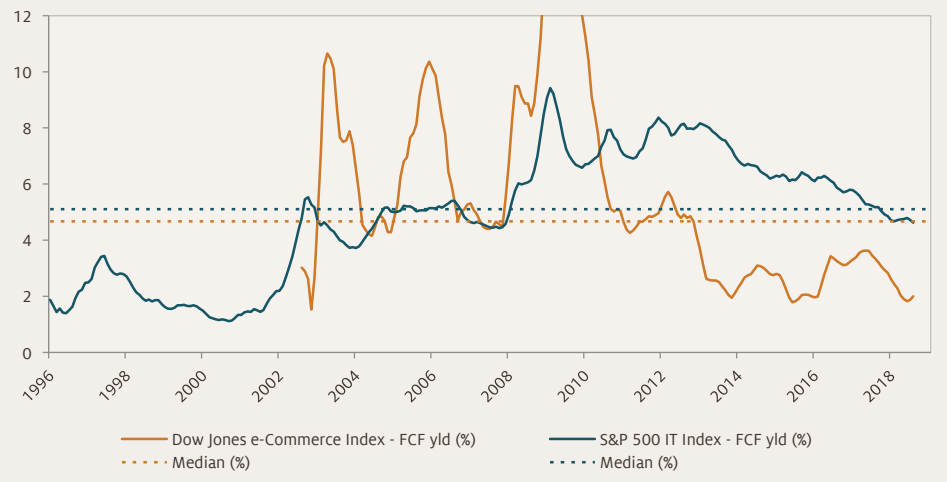
II. How to Value the Innovation Tsunami

We have discussed three solid reasons for believing e-Commerce is a bubble, but unequivocal bears risk tarring all companies in the index with the same brush. This is misguided. As we learned from the experience of the Nikkei bubble in the late-1980s, the excesses were largely in the financial, real estate and construction sectors, whereas numerous companies in autos and electronics possessed solid business models. Similarly with tech in the late-1990s, where Pets.com and Webvan failed completely, companies such as eBay and Amazon recovered quickly and went on to amply reward patient investors. This demonstrates that it is critical to develop a framework for analyzing e-Commerce companies that allows us to separate the proverbial wheat from the chaff, which is what we set to do in the remainder of this note.

One of the themes from our "Tech is the New Macro" framework is that digital platforms can produce extremely powerful business models that benefit from low (sometimes near zero) marginal costs, turbo-charged by powerful network effects. Such scalability produces winner-takes-all dynamics that have resulted in neo-monopoly profits for dominant firms and increased concentration in most sectors of the economy. Moreover, the pace of technological change continues to accelerate, suggesting we are nowhere near the late stages of this transformation.

While the tech sector's FCF yield is close to its historical median, e-Commerce provides a yield that is well below normal and even lower than the tech sector's average in the late-1990s

FIGURE 4: The e-Commerce Index Trades on FCF Yield of only 2.0%



Source: Bloomberg, Epoch Investment Partners. As of August 31, 2018.

Cheap changes everything

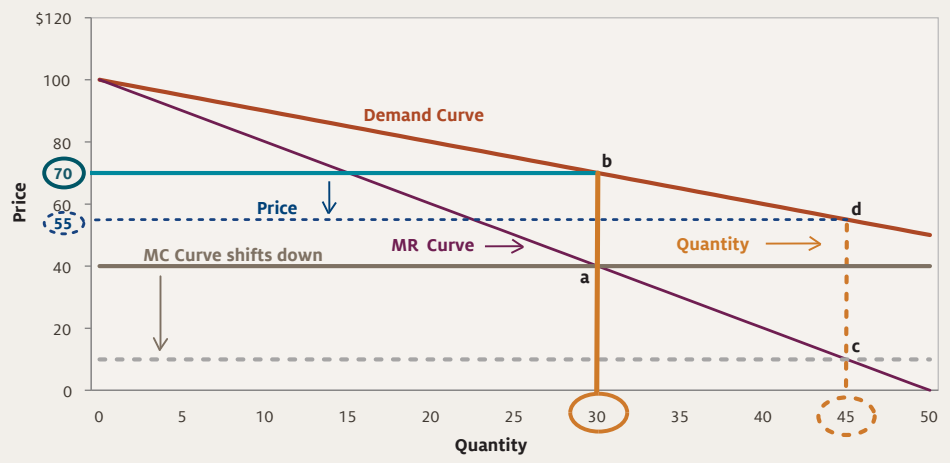
The subtitle for this section comes from Chapter 2 of *Prediction Machines*, a book that makes AI easier to understand by recasting it as "a new, cheap commodity—predictions."[4] The book also provides several historical examples of how lower costs have resulted in dramatic changes in the structure of our economy. For example, two centuries ago, it would have cost you four hundred times what you are paying now for the same amount of light. The huge drop in price associated with incandescence (first demonstrated in 1761, but not commercially practical for another century) lit up the world, turning night into day, and allowing for the emergence of 24-hour factories, the garish billboards in Times Square, and Friday night football. Other technologies that have experienced dramatic price declines and radically changed the global economy include steam power, the automobile, the integrated circuit and, most recently, AI.

Digital technologies are much more powerful than their predecessors though, because they are inherently scalable (as bits can be copied over and over again, perfectly, instantaneously and costlessly). This allows costs such as tech infrastructure to be spread over thousands, millions, and sometimes billions, of customers. Further, the declining cost of computing and AI lowers the cost of predictions, such as what we would like to buy on Amazon, watch on Netflix or listen to on Spotify. Cheaper AI will also soon lead to widespread adoption of autonomous vehicles and robotics, as well as systems

4. *"Prediction Machines: The Simple Economics of Artificial Intelligence," by A. Agrawal et al, Harvard Business Review Press (2018).*

Tech lowers the MC curve so that it now intersects MR at point "c," which is where the firm sets quantity. The new price is determined by moving vertically up to the Demand curve (point "d").

FIGURE 5: Digital Technology Allows Firms to Adopt a New Business Model, Dramatically Reducing Marginal Costs and Resulting in a Massive Win-Win



Source: Epoch Investment Partners

for fraud detection, language translation, medical diagnosis, and so on.

We use this perspective to illustrate the profound transformation to a company's business model that occurs when it enters the Digital Age. Specifically, we believe the substitution of bits for atoms can massively lower a firm's MC curve. In the present example we assume the MC curve shifts down, say from $40 to $10, so that it now intersects the MR curve at point "c" rather than point a (implying the firm increases its production from 30 to 45). The price is now determined by point "d", suggesting a price of $55 (vs. $70 previously at point "b"). The result is a massive win-win, with both the company and consumers being much better off (**Figure 5**).

Your marginal cost is my opportunity

While the above discussion is a bit esoteric, it is core to the strategies adopted by all e-Commerce companies, including Amazon, Google and Facebook. By investing heavily in tech infrastructure they are able to dramatically lower their marginal cost curves, which gives them an almost insurmountable competitive advantage. This is particularly well embodied by Jeff Bezos who has famously declared, "Your margin is my opportunity."

This point was also emphasized recently by another titan of the tech world, Bill Gates: "Microsoft might spend a lot of money to develop the first unit of a new program, but every unit after that is virtually free to produce. Unlike the goods that powered our economy in the past, software is an intangible asset. And software isn't the only example: data, insurance, e-books, even movies work in similar ways. The portion of the world's economy that doesn't fit the old model just keeps getting larger. That has major implications for everything … but in general, the rules that govern the economy haven't kept up. This is one of the biggest trends in the global economy that isn't getting enough attention."[5] In fact, intangible assets now represent 84% of the total market value of the S&P 500, up from 17% in 1975. Everything has changed, except for our way of thinking.

Silicon Valley's greatest invention isn't hardware or software…it's a business model

Digital strategies clearly call for quite different business models, which explains why many up-and-coming e-Commerce firms rush to build out their tech infrastructure and business processes before potential competitors beat them to it. This is important as the history of Silicon Valley strongly suggests timing is crucial and that the most successful innovators will capture the bulk of profits, with the rest of the pack left scrambling for scraps. Such "blitzscaling" provides e-Commerce companies with several potential advantages, including much lower marginal costs as well as network effects, which make it easier and less costly to acquire new customers.

Moreover, we believe the biggest invention in Silicon Valley wasn't the transistor, personal computer, internet browser or iPhone, but rather the entrepreneurial start-up model that is best suited to an intangible economy. With its deep network of VC firms, veteran engineers and iconoclastic hackers, Silicon Valley is likely to remain one of the centers of the tech universe because it is the place with the least

5. *"Not enough people are paying attention to this economic trend," by Bill Gates (Aug 14, 2018).*

Notice all the titans that have risen meteorically, as well as those that have fallen abruptly from grace

FIGURE 6: Clash of the Titans – Largest Tech Companies (ranked by market cap, USD)

Rank	Dec-92	Jan-95	Jan-00	Jan-05	Jan-10	Jan-15	Aug-18
1	IBM	Escom	MSFT	MSFT	MSFT	Apple	Apple
2	MSFT	IBM	NTT Docomo	Vodafone	Alphabet	MSFT	Amazon
3	Hitachi	MSFT	Cisco	IBM	Apple	Alphabet	Alphabet
4	Panasonic	Panasonic	Intel	Intel	China Mobile	Alibaba	MSFT
5	Intel	Hitachi	Nokia	Cisco	IBM	China Mobile	Facebook
6	HP	Intel	IBM	Dell	Cisco	Facebook	Alibaba
7	Alcatel-Lucent	HP	Oracle	NTT Docomo	Oracle	Oracle	Tencent
8	Toshiba	Toshiba	Vodafone	eBay	Vodafone	Samsung Elec	Visa
9	EDS	Sony	Nortel	Nokia	HP	Intel	Samsung Elec
10	Sony	Sharp	Dell	Oracle	Intel	Visa	Intel
11	Emerson	EDS	Ericsson	Qualcomm	Samsung Elec	IBM	Mastercard
12	Nintendo	Fujitsu	Sony	China Mobile	Qualcomm	Amazon	TSMC
13	Nortel	NEC	HP	Samsung Elec	Visa	Cisco	Cisco
14	Sharp	KDDI	Yahoo	HP	NTT Docomo	Tencent	Oracle
15	Novell	Vodafone US	Qualcomm	SAP	Amazon	Qualcomm	China Mobile
16	NEC	Emerson	EMC	Google	SAP	TMSC	Nvidia
17	Mitsubishi Elec	Kyocera	Softbank	Yahoo	Canon	Mastercard	Netflix
18	Fujitsu	Canon	Motorola	Ericsson	TSMC	Vodafone	SAP
19	Xerox	Oracle	Fujitsu	Canon	Nokia	SAP	IBM
20	Corning	Alcatel-Lucent	PSI Software	TI	Hon Hai	Baidu	Adobe
21	Apple	Ericsson	AOL	Motorola	Tencent	HP	TI
22	Sega	Xerox	TI	Panasonic	Blackberry	Softbank	Salesforce
23	Kyocera	Nokia	China Mobile	TSMC	EMC	eBay	Paypal
24	Vodafone	Compaq	NTT Data	Yahoo Japan	Panasonic	NTT Docomo	NTT Docomo
25	Ericsson	Vodafone LN	Hikari Tsushin	Sony	China Telecom	EMC	Booking Hold

Source: Bloomberg, Epoch Investment Partners. As of August 31, 2018.

resistance to new ideas. Further, it appears that the rate of disruptive change is accelerating, so that technology is going to become even more of a threat to incumbent companies and prevailing business models.

Given this dynamic, and the importance of scale and network effects, many new companies are spending voraciously to build up their tech infrastructure and acquire customers. However, this means that many will have an extended period of being negative FCF, but with the aspiration of eventually becoming sufficiently FCF generative to justify the patience of their investors. This raises a potential contradiction for such long-duration strategies: If the process of creative destruction is getting faster and faster, yet e-Commerce companies are taking longer and longer to become FCF positive, isn't there a rising probability that they themselves will be prematurely disrupted? That is, their business models and technologies might be obsolete, disrupted by the next generation of upstarts, before they are able to produce sufficient cash flow to reward their patient shareholders. The question remains whether this dynamic is a genuine risk for many new e-Commerce companies.

III. "Titans rise, Titans fall— That's the nature of the world. It just happens faster in Silicon Valley"[6]

The Digital Age has undoubtedly turbo-charged the process of creative destruction, which is now occurring more swiftly and tumultuously than ever before. However, it has always been the case in tech that titans rise and then, often quite suddenly, titans fall. Some of the notable examples of this process include: Atari in the late-70s to early-80s (marked the beginning of the PC, created a new American art form and, at its peak, was the fastest growing company in U.S. history, and then "poof," it pretty much disappeared), America Online (king of the dial-up internet era), Netscape in the late-90s (was dominant from 1995–1998, but lost to Microsoft in the "browser wars"), and MySpace a decade ago (it was the world's #1 social networking site from 2005–2008, but was then overtaken by Facebook). Technology has a long history of producing disruptive companies that appear dominant and unstoppable one year, only to find themselves abruptly and acutely on the ropes as they in turn are disrupted. (**Figure 6**)

For a more quantitative perspective, we estimate that companies that are in the top 10 at one moment in time had a 60% chance of remaining in the top group five years later, a 45% chance after a decade, and only 35% after 15 years had passed. The companies currently at the top of the list look entrenched and difficult to dislodge, but they always do, and the historical record suggests we should expect the rankings to change quite substantially between now and 2023 or 2028.

Looking at the next tier of companies, those ranked 11th to 25th, only 55% of them remained in the top 25 five years later, a figure that dropped to 30% after a decade. On the other hand, for these second tier companies there is only a 15% chance of moving into the top ten after a decade has passed. This suggests they are in a very competitive and dynamic space, with a much higher probability of moving out then of moving up.

At first, it might seem quite remarkable how many companies come from out of nowhere to make it into the top ten. Such companies in the 2000s included eBay, Cisco and Google, while more recent entrants have included Facebook, Amazon, Alibaba and Tencent. However, statistically, the numbers are not so encouraging. On average only 15% of companies in the top 10 weren't even in the top 25 list five years earlier, a number that rises to 30% if the lookback is increased to ten years.

Most new e-Commerce companies are unlikely to attain titan status, and even if they are fortunate enough to make it to the top, their station there will probably be fleeting and ephemeral. Titans do rise, occasionally very quickly, but they also fall, and in many cases shockingly fast. Given this reality, business models that are predicated upon FCF many years into the future should be treated with a healthy dollop of skepticism. The meteoric success of companies such as Amazon, Google and Facebook attest to the wealth that can be created when a new global champion arrives on the scene. However, this happens less frequently than many upstart e-Commerce companies would like to have us believe.

IV. The Good, the Bad and the Ugly: A FCF Approach to Valuing e-Commerce Companies[7]

The previous two sections demonstrated that the Digital Age has produced a radically powerful business model that can be characterized by very low marginal costs and winner-takes-all economies of scale, but at the same time has also turbo-charged the pace of innovative disruption in a way that shortens the expected life span of early stage e-Commerce companies. This challenging dynamic highlights the importance of having a robust FCF framework that allows investors to distinguish between good, indifferent and bad e-Commerce models.

Epoch has always focused on identifying companies with business models that are capable of generating sustainable FCF. That doesn't mean they need to be FCF generative from day one, but we do need to be confident that their management teams excel at capital allocation, including investing today for future value creation. While there are a number of approaches capable of putting these principles into practice, this section focusses on the framework advocated by NYU's Aswath Damodaran (often referred to as Professor "Cash Flow").

Having a rigorous framework is crucial because many e-Commerce businesses market themselves to investors simply on the basis of the numbers of customers and subscribers they have. This is especially true of social media companies, but even firms like Netflix

6. From "Valley of Genius: The Uncensored History of Silicon Valley," by Adam Fisher (2018).

7. This section is based on "User and Subscriber Businesses: The Good, the Bad and the Ugly!" and "Going to Pieces: Valuing Users, Subscribers and Customers" by Aswath Damodaran, NYU (2018).

prefer to emphasize the growth in its subscriber base rather than bottom-line metrics. This leads some analysts to become dazzled by the numbers of users and to not probe deeply enough, particularly when examining young, loss-making companies that may never become FCF-generative.

On the other hand, many developing e-Commerce companies with solid business models lose money solely because they are still early in their life cycle. The reaction of many old-time value investors is to simply view these companies as overvalued fads, arguing that user-based companies all lose money, without having done a proper and comprehensive analysis. This approach is also mistaken, as experience has demonstrated that some of these companies will emerge from their growing pains as valuable, FCF-generative companies. Ultimately, it is important to understand why a company is bleeding cash, since there are good ways of losing money as well as bad ones.

When valuing e-Commerce companies it is crucial to recognize that the number and growth of users is not the end game, but rather a means to an end. Value ultimately comes from cash flows, although forecasting and valuing these cash flows raises a number of challenges. Damodaran illustrates his approach through three examples (Uber, Amazon Prime and Netflix), thus providing a framework for differentiating between great and mediocre companies.

While valuation first principles do not change when analyzing e-Commerce companies, what does change is the information that is needed and the mistakes that have to be avoided. That is, the issues that bedevil such valuations are not theoretical but are related to information disclosure and accounting

Crucial to avoid the bottom-left quadrant, as these companies are unlikely to ever become FCF-generative

Figure 7: Competitive dynamics for e-Commerce companies

	Cost of New User: High	Cost of New User: Low
Existing User Value: High	Exclusive Users: Companies focus on getting highest value users & keeping them.	Value Stars: These companies have strong competitive advantage with pricing power.
Existing User Value: Low	Value Dogs: May have lots of users, but these companies will continually lose money, even as they grow.	Commoditized Users: Companies with the most users will win and have higher value

Source: Damodaran

practices. For example, some companies are unwilling to disclose information that investors need to judge their value (e.g., user renewal rates and client acquisition costs). This suggests that accounting rules and information disclosure laws have not yet caught up to the shift to user-based companies.

For e-Commerce companies there are three different revenue models to generate cash flows. First, a subscription model (e.g., Netflix), which typically exhibits higher user stickiness (making revenues more predictable), but involves higher client acquisition costs. The second relies on advertising revenues (e.g., Facebook and Google), a model that scales up faster as adding new users is easier, but revenues are heavily driven by user intensity and churn rates are often quite high. Next, transaction models (e.g., Uber and eBay), which Damodaran views as the riskiest. Additionally, many companies have adopted hybrid models (e.g., Spotify, LinkedIn, Amazon), which involve a combination of the three revenue approaches. However, regardless of the revenue model, the value of a user or subscriber is always the present value of the expected cash flows that are expected to be generated from that user.

There are also several ways in which competitive dynamics affect the valuation of e-Commerce companies. Creating digital moats is crucial, as a user-based company that does not have significant barriers to entry will struggle to create value no matter how many users it adds, because the competition will keep a lid on its pricing power. Often such moats are based upon economies of scale, which provides three potential advantages. First is lower marginal costs. Second, network effects make it easier and less costly to acquire new users. For example, a ride sharing company like Uber exhibits network effects if, as it gains a larger share of the local market, both drivers and customers perceive greater benefits from switching to it.

Regarding the third potential advantage, the most successful e-Commerce companies use their scale to gather and exploit big data (e.g., Google, Facebook and Amazon). This can help them move towards becoming "Value Stars" (**Figure 7**), with high value per existing subscriber and low user acquisition costs. In the best case this allows the company's AI capabilities to act as "prediction-machines," providing useful recommendations regarding what to buy, read or watch. Such companies aim to monetize the big data they have gathered by either selling more products

(for transaction-based companies), charging higher premiums (subscription-based firms) or directing advertising more effectively. However, although many e-Commerce companies aspire to exploit big data in a meaningful way, investors need to keep in mind that only a few manage to succeed.

In Damodaran's framework, the value of an e-Commerce company depends upon the value of its existing users, plus the value of the new customers it will acquire over time. The third input into his valuation formula is the NPV of what Damodaran refers to as "corporate drag":

Value of Operating Assets = Value of Existing Users + Value of New Users – Corporate Drag

The first input is the NPV of the expected cash flow stream from an existing user, multiplied by the number of users. Calculating this requires estimates for: the average revenue per user (ARPU) and its expected growth rate; how much will be spent servicing existing users (e.g., shipping costs for Amazon); and the average user renewal rate (especially important for subscription-based companies).

Calculating the expected value of new customers is similar, but requires two additional estimates: the costs to acquire new users (e.g., marketing and promotional expenses); and the expected growth rate of new customers. The former is important because user-based companies can spend too much on acquiring new customers and destroy value in the process. Most analysts reward stronger growth companies with higher valuations, but not all growth is created equal.

The third input that needs to be calculated is the NPV of "corporate drag." It includes expenditures on tech infrastructure and business development, including G&A expenses and other operating costs that are not directly related to users. It also includes the cost of content for companies like Netflix (which is estimated to have spent $9 billion in 2017 and over $12 billion this year). Analysts also need to assess the expected growth rate in corporate drag, a number that is crucial to becoming FCF-generative. Specifically, in healthy firms there will be economies of scale, which means these expenses should grow at a lower rate than revenues, creating a pathway to profitability.

Having laid out a framework for valuing e-Commerce companies, Damodaran then applies this approach to Uber, Amazon Prime and Netflix. First, to calculate the value of an existing user he estimates renewal rates (95% for Uber, 92.5% for Netflix and 96% for Amazon Prime) and the expected lifetime of their business models (15 years for Uber and Netflix, 20 for Amazon). He then calculates net ARPU (estimating, for example, that Uber receives 20% of net billings and that Amazon Prime spent $117 per subscriber on shipping costs in 2017) and positing an annual growth rate (12% for Uber vs. Netflix's 5% and Amazon Prime's 10%). It is then straightforward to calculate that the value of an existing user at Uber is $449.17 (multiplied by 40 mn customers to yield a total value of $18.0 bn) vs Netflix's $508.89 (times 117 mn subscribers for a value of $59.8 bn), and Amazon Prime's $584.53 (times 100 mn subscribers to yield $58.5 bn).

Second, Damodaran determines the value of new users by first estimating the cost of acquiring a new subscriber ($238.75 for Uber, vs $111.01 for Netflix and $100 for Amazon Prime), and assuming this cost grows at the inflation rate. He then posits that the number of new customers at Uber grows at a 25% rate for the next five years and 10% for the following five years, before settling into stable growth of 1.5% (the corresponding growth rates are 15%, 10% and 1% for Netflix and 10%, 2% and 2% for Amazon Prime). This implies that the value per new Uber customer is $210.39 ($449.17-$238.78), leading to a collective value for new users of $23.9 bn (the corresponding numbers are $397.88 and $137.3 bn for Netflix, and $485.53 and $101.8 bn for Amazon Prime).

A number of assumptions are made to place a value on corporate drag, which is calculated to be $10.4 bn for Uber (vs Netflix's $111.3 bn, reflecting enormous content costs, and Amazon Prime's $87.3 bn). Damodaran then obtains estimates for the value of Uber (and then later for Netflix and Amazon Prime) by plugging the above numbers into his formula.

Having an explicit model is also crucial for understanding the impact of changes in revenues or other inputs (e.g., the annual cost of Amazon's Prime membership increased to $119 on May 11, 2018). It is also essential for understanding what expectations are incorporated into the price of a company and assessing whether they are reasonable. For example, regardless of how generous our assumptions are regarding Netflix's revenues and growth, we cannot come up with a plausible scenario in which its shares appear reasonably priced.

Finally, this framework suggests three warning signals to be cognizant of when analyzing e-Commerce companies. First, beware of companies that make it "all about users, all the time." It is a conspicuously dangerous sign if the entire sales pitch is about user or subscriber numbers, rather than operating results. While large customer

numbers are a positive, it requires a viable business model to convert them into revenues and cash flows. Companies that do not understand this have losses that scale up as the company gets bigger, and then go bankrupt with lots of users. Second, be skeptical of companies that lack transparency regarding key metrics such as renewal rates and client acquisition costs. The companies that are most opaque are typically the ones that possess user models that are not sustainable. Lastly, many e-Commerce companies talk loosely about all the data they are collecting from their users, without being able to explain clearly how it gives them an edge and how they will be able to monetize it through higher ARPU (e.g., from targeted advertising, selling additional products or raising subscription prices). The monetization of data is only going to become a bigger and bigger issue, but so far only a small minority of e-Commerce firms have been able to do this successfully.

Investment Conclusions

We began this note by asking whether e-Commerce is just another bubble waiting to be popped, and suggested there are three good reasons to believe the answer is yes. First, asset price bubbles always depend on excess credit growth and during the last decade there has been an unprecedented increase in central bank liquidity. Next, the FCF yield of the e-Commerce index is even lower than the tech sector's was in the late-1990s. Third, titans rise, titans fall—it just happens faster in Silicon Valley. We worry that the Digital Age has turbo-charged the process of creative destruction, yet many e-Commerce companies are taking longer and longer to become FCF positive. Doesn't that imply a rising probability that they themselves will be prematurely disrupted, meaning the long promised FCF stream will never arrive?

The above argument paints a rather bearish picture, but misses two key points. First, the Digital Age and the transition from "atoms" to "bits" has resulted in extremely powerful business models that benefit from low (sometimes near zero) marginal costs, turbo-charged by powerful network effects. Such scalability produces winner-takes-all dynamics that have resulted in neo-monopoly profits for dominant firms. The result is a seminal business model that is capable of producing an impressive win-win, with both companies and consumers becoming vastly better off.

Second, there is a risk of tarring all e-Commerce companies with the same brush, a mistake that investors need to avoid as history suggests that some of today's up-and-coming e-Commerce companies are likely to become the Google or Facebook of the next decade. Separating the proverbial wheat from the chaff requires that investors look well beyond user growth numbers. Specifically, it is crucial to apply a rigorous approach that is focused on the ability to produce FCF on a sustainable basis and on management's skills in capital allocation, including investing today for future value creation.

While the e-Commerce index as a whole appears frothy, many companies in the sector do possess sound and promising business models. Epoch has always focused on identifying companies with business models that are capable of generating sustainable FCF. That doesn't mean they need to be FCF generative from day one, but we do need to be confident that their management teams excel at capital allocation, including investing today for future value creation. While there are a number of approaches capable of putting these principles into practice, this paper presented the framework advocated by NYU's Aswath Damodaran.

This paper has concentrated on e-Commerce companies, but Epoch has always believed that, regardless of geography or sector, investors should focus on companies that: (a) have an ability to produce FCF on a sustainable basis; and (b) possess superior managements with a proven track record of allocating capital wisely, including investing today for future value creation. We are confident that these companies are the most probable winners and the ones most likely to provide investors with the best returns. Crucially, we believe these principles are as relevant to e-Commerce companies as they are to firms in more traditional sectors such as consumer staples or industrials.