The Disruptive Strategist

Marketing material for professional, institutional and accredited investors

Executive Summary

In our Q1 2022 newsletter, members of GAM Investments' Global Equities team cover topics including Q1 in numbers, semiconductors, storage, artificial intelligence and machine learning, and the gamification of everything.

Mark Hawtin looks back at Q1, examining some of the facts and figures underpinning a world where uncertainty currently reigns.

Pieran Maru discusses the supply and demand dynamics in the semiconductor cycle and some of the industries which have been impacted.

Mark Hawtin examines the huge amounts of data being created and the challenge of how to create enough storage capacity for it.

Kevin Kruczynski takes a look at how AI and machine learning are in the early stages of being applied to lending.

David Goodman highlights the proliferation of gamification and how it is being used to engage and incentivise people in many different ways.

Q1 in numbers
By Mark Hawtin

The first quarter of 2022 continued where Q4 2021 left off where growth was concerned. Duration assets were again slammed hard into the backdrop of inflation that printed higher than most expected and the start of a rate tightening cycle that currently looks set to last longer and move higher than thought only a few months ago.

Bond yields were driven higher throughout the quarter with March 2022 the worst month for the US Treasury aggregate index since July 2003. The US 30-year yield rose from approximately 1.9% at the start of the year to 2.5% by the end of the quarter.[1] Equity markets on a broad level have, however, remained surprisingly solid. Against a very uncertain backdrop and the break out of war between Russia and the Ukraine, the S&P 500 fell just 4.3%.[1] Reflecting the interest rate path, the Nasdaq 100 fell 9.1%[1] with duration assets falling faster and further. As a reflection of the highest growth section of the market, the ARK Innovation ETF fell 30% in Q1.[1] So risk is continuing to get re-priced and at a rapid rate. The comparison between new and old technology shows this clearly. The Morgan Stanley New Technology Index fell 15.2% in Q1 while the Old Technology index fell just 5.8%[1]. Rotation has been severe and this has been painful for all growth investing strategies, in our view.

At times like this, we believe the challenge is not to beat the index because it has plenty of names that growth investors cannot consider in sectors like energy, utilities and materials (all of which have performed well over the course of Q1). In addition, sectors like consumer discretionary have plenty of strong performers among names not considered by growth investors in hotels, travel and casinos. Instead the challenge is in aiming to mitigate the risks

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[1] Source: Bloomberg, as at 31 March 2022.

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by recognising the pattern of market activity and moving down the duration curve. This has led us, for example, to reduce high growth exposure in favour of cash and more well balanced growth and profitability profile names. The importance of actively managing risk in growth portfolios is clear when looking at the chart below from Morgan Stanley which shows the relative performance of the top 15% of the market by valuation versus the S&P. All of the Covid outperformance has been relinquished with many names falling more than 50% from their peaks.[2]

Top 15% Most Expensive Stocks/S&P500
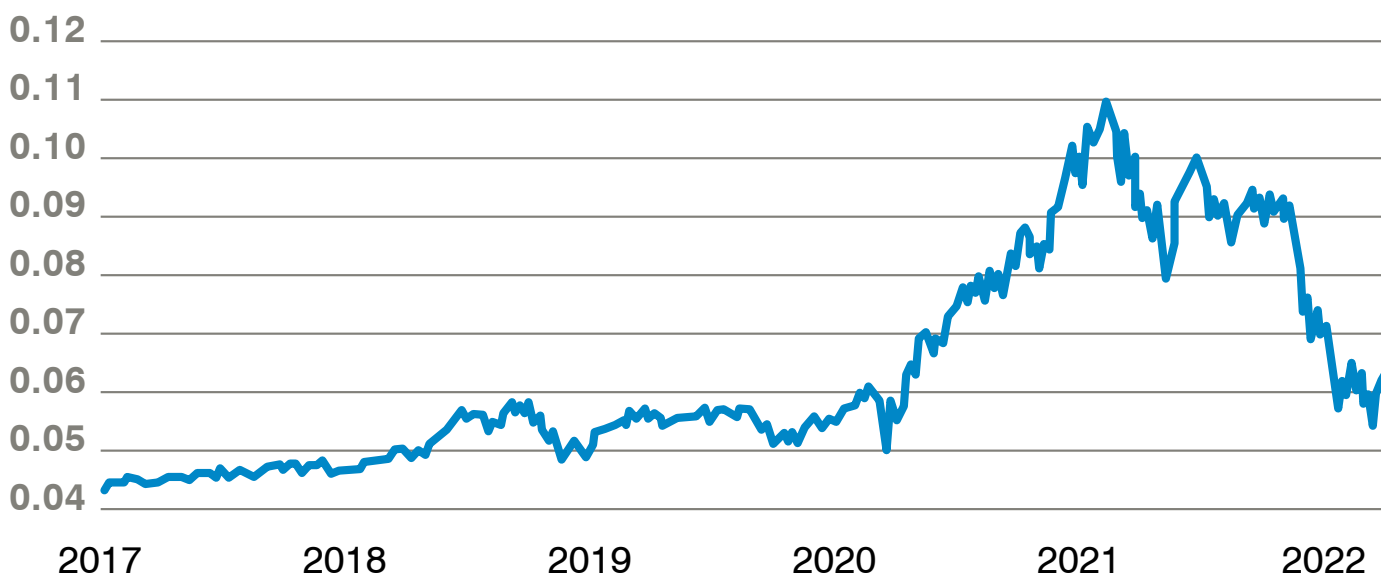
Source: Bloomberg, Morgan Stanley Research. For illustrative purposes only. Past performance is not a reliable indicator of future results or current or future trends.

In a world where uncertainty reigns, the FANG complex has also been generally robust, representing solid cash flow generating exposure. With the exception of Meta, which fell 33.9% in Q1, the other mega caps did well. Apple fell just -1.7%, Amazon -2.2%, Alphabet (Google) -3.5% and Microsoft -8.5%.[2] Our research shows these names have become even more concentrated holdings at the top of many funds and investor portfolios.

China continued to be challenging in the first quarter: with concerns over China's stance in the Russia-Ukraine conflict, mid-March saw China's Hang Seng Index hit an all-time low. However, this fall was followed by the highest volume traded and the biggest one-day rebound ever seen for Chinese shares, marked by a 22% rise in the HSTECH and a 40% bounce in the KWEB (a proxy for China internet) in a single day on 16 March.[2] Sentiment and flow marginally recovered as China's Vice Premier Liu He addressed key market concerns, such as delaying property tax, granting ADR audit access, and mild monetary easing. Key overhang remains on the radical Covid lockdowns since March this year that weighed on China's economic growth and global supply chains, which need to be removed for China to thrive and to meet its 5.5% 2022 GDP growth target.

Semiconductors
By Pieran Maru

Semiconductors ignited headlines in 2020 with disruptions to supply chains worldwide. Two years in and we continue to see shortages throughout multiple industries – with anticipated normalisation drifting into 2023. So, what caused it? A classic mismatch of demand/supply on the semiconductor cycle, with a pandemic catalyst. In the lead up to 2020, we saw rising tensions between the US and China, as several Chinese companies were added to the US Entity List.

Historical total semiconductor YoY sales growth
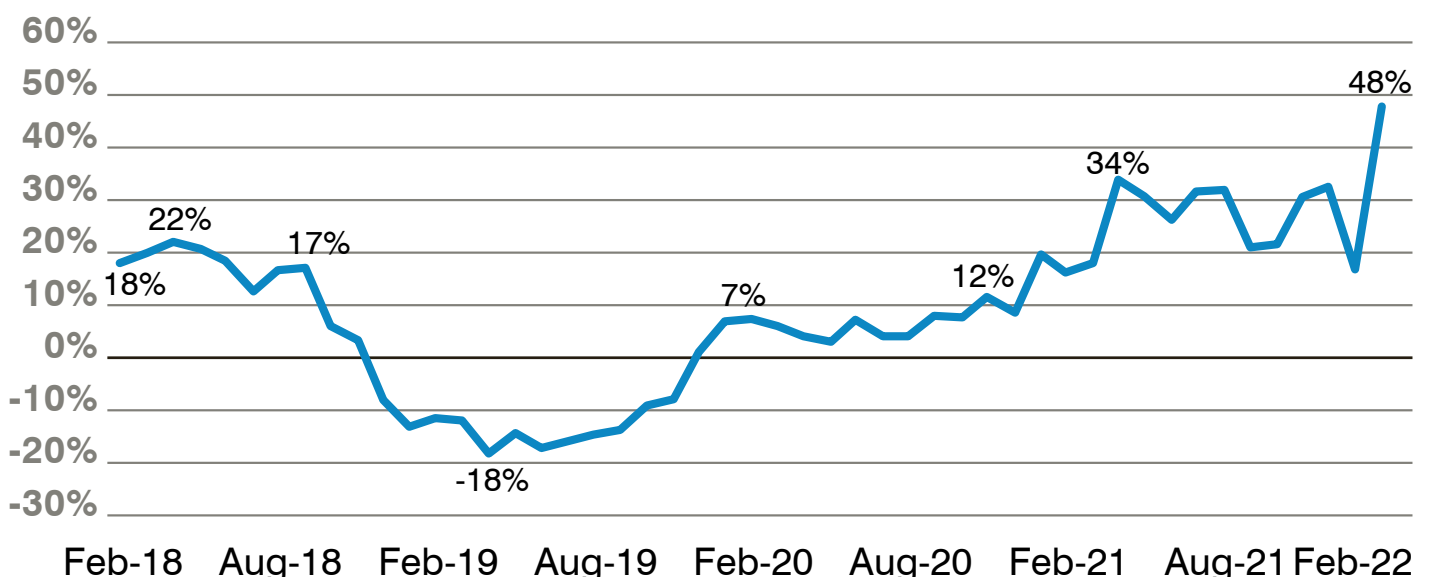
Source: WSTS, Bernstein Analysis. For illustrative purposes only. Past performance is not a reliable indicator of future results or current or future trends.
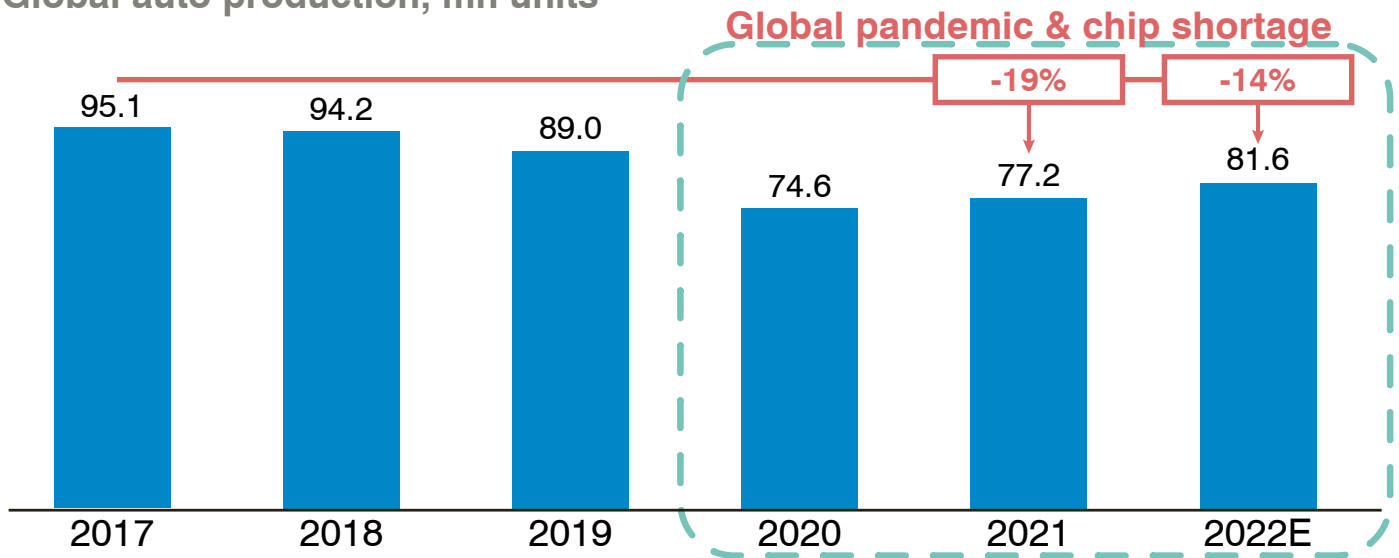
By March 2020, unexpected demand entered the cycle with increased consumer electronics orders, as firms adjusted to remote working. Demand was also supported by increasing inventory build up due to continued geopolitical risks while unpredictable rolling outages due to lockdowns further tightened the supply end. Recent estimates place the cost of China's zero-Covid policy at approximately USD 46 billion a month (3.1% of GDP) while Brian Deese, director of the US National Economic Council, estimates the semiconductor shortage "probably took a full percentage point off of GDP in 2021." (estimates as at 31 March 2022).

Automotive
One industry heavily impacted by the supply constraints is automotive. Mercedes sales fell 15% in Q1, with Ford's total sales dropping by 25.6% compared to the year prior. We can see this imbalance having knock on effects in the second-hand car market with a number of cars now selling at a premium to list. Semiconductors are essential to the production of modern day cars – from advanced driver-assistance systems to braking systems. Without them, production can soon come to a halt. Recent examples this quarter include the Mini plant closing for two weeks due to shortages while Tesla's factory in Shanghai closed temporarily during a local lockdown and to abide by community orders.

Auto volumes have been slow to recover post COVID-19 with 2021 still sitting 19% below the 2017 peak...

Global auto production, mn units

Global pandemic & chip shortage

				-19%	-14%
95.1	94.2	89.0	74.6	77.2	81.6
2017	2018	2019	2020	2021	2022E

Source: Goldman Sachs, IHS. Research as of 31 March 2022. For illustrative purposes only. Estimates are not actual and may vary widely from the estimates shown.

Neon Gas

Neon is an essential noble gas used for excimer lasers as part of the lithography process in the production of semiconductors. Neon makes up ~0.0018% of air and is isolated as a byproduct, predominately by the steel industry using an Air Separation Unit (ASU). There are approximately 28 large ASUs globally with ~10 locations around the globe able to purify the crude mixture. With two of the leading suppliers of neon based in Ukraine having stopped production, estimates place the impact on world supplies at 30%.[3] At present, this is not expected to impact the semiconductor shortage materially further, in our view, given companies have built up strategic inventories with a number of global suppliers and have been able to further diversify sourcing since 2014. With the significant rise in neon prices, we expect more ASUs to be built and expect normalisation to occur by the end of the year.
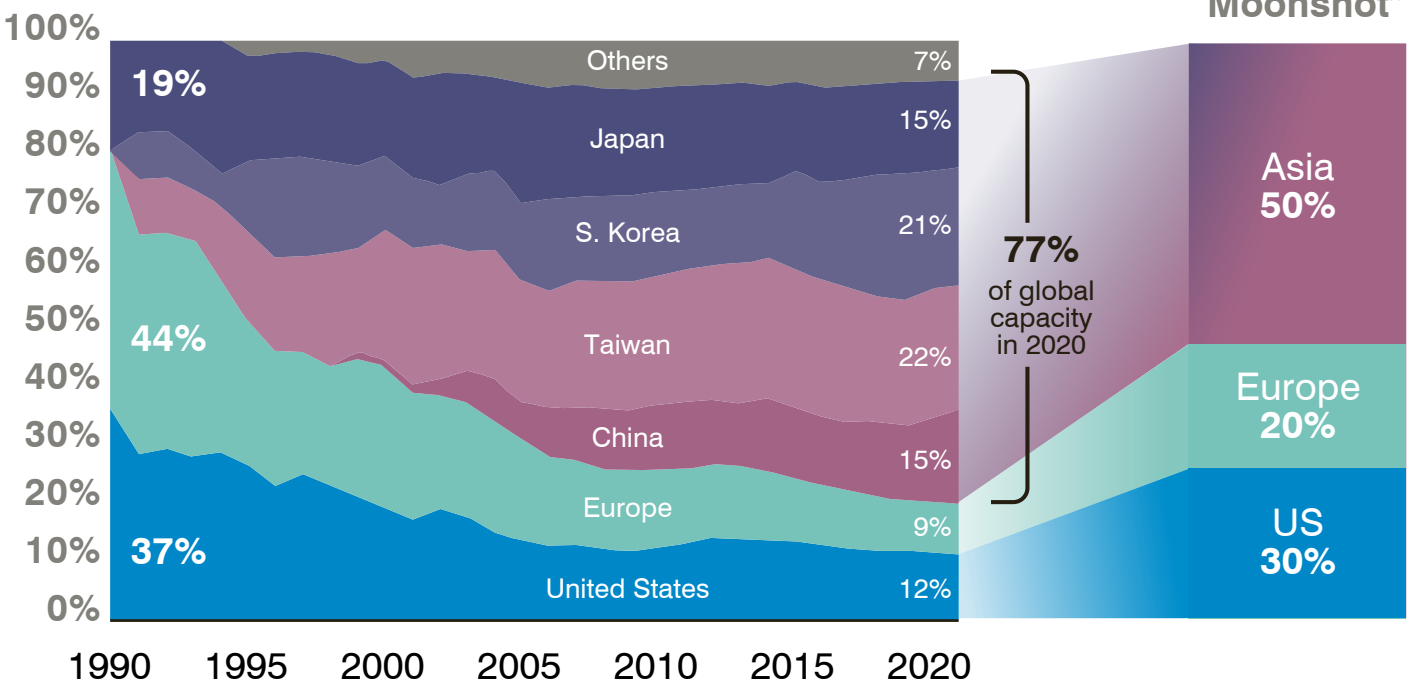
Equilibrium in sight?

The US Senate recently approved an amended bill to provide USD 52 billion for the US semiconductor chips – now currently sitting at the 'resolving differences' stage of the legislation process. This would allow manufacturers to reduce reliance on supply chains from other countries and support domestic semiconductor production, research and development. While from a European perspective, the European Commission announced a framework of measures for strengthening their semiconductor ecosystem, which will add EUR 15 billion to an existing EUR 30 billion already planned. President von der Leyen highlighted two main goals in her statement on 8 February: First, to increase resilience to future crises and second, to make Europe a leader, with the aim of representing 20% of global market chips production by 2030 (currently 9%). This would imply an estimated fourfold increase in effort, given demand is expected to double by then. The current heavy reliance on Asia for semiconductor manufacturing can be seen from Intel's 2022 Investor meeting (figure below), highlighting the shift in geographical location over time and in their view, the expected "moonshot" distribution in the future.

[3] Bloomberg, as at 31 March 2022.

The world needs more balanced and resilient supply chains

% Total Semi Manufacturing Capacity

Our "Moonshot"

Chart values (1990 → 2020):
- Others: 19% → 7%
- Japan: 15%
- S. Korea: 21%
- Taiwan: 44% → 22%
- China: 15%
- Europe: 9%
- United States: 37% → 12%

77% of global capacity in 2020

Moonshot: Asia 50%, Europe 20%, US 30%

X-axis: 1990 1995 2000 2005 2010 2015 2020

Source: Intel 2022 Investor Meeting. For illustrative purposes only.

The global supply constraints have highlighted how critical semiconductors are in all industries and the importance of maintaining a level of inventory to ensure minimum disruption. This has caused companies to move from a "just in time" inventory to "just in case" elevated levels. However, it remains to be seen if or when the impact of excess and duplicate ordering will begin to show as orders are filled and customers stop building inventory.

The perfect (Storage) Storm
By Mark Hawtin

Boeing is going to design its next aircraft in the metaverse – just one example of the fourth digital wave that looks poised to sweep through industrials, healthcare, transportation, financials and many other traditional industries. What many fail to understand is the impact this wave will have on data creation. Facebook generates 4 petabytes of data per day or 4,000 terabytes.[4] A single engine on a transatlantic flight generates about 140 terabytes of data.[5] Assuming two engines per aircraft, that means that 10-15 transatlantic flights generate the same amount of data just from their engines that 1.6 billion Facebook users generate daily. The point is that the Digital 4.0 wave will vastly accelerate data creation. Walmart has published a figure that shows they generate 2.5 petabytes of data every hour in the store's network.[6] These numbers are vast.

To try and illustrate the scale of data creation and the acceleration effect, it is widely quoted (and originally attributed to IBM back in 2012) that 90% of all data was created in the last two years. If the amount of data captured and stored doubles every 1.2 years, the data created in a single day and stored on DVDs would create a pile that would extend

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[4] Source: Facebook, as at 31 March 2022.
[5] Source: Royal Aeronautical Society, as at 31 March 2022.
[6] Source: Walmart as at 31 March 2022.

to the moon and back! Yet, we only analyse 0.5% of the data we create. Forrester estimates that a mere 10% increase in the amount of data actually utilised effectively in the Fortune 1000 would result in a USD 65 billion increase in net income.[7] Simply put, in our view, data is becoming the single most valuable commodity in enterprise productivity, and we store and analyse very little of the vast amount that is generated.

From an investment standpoint, data storage becomes a really interesting theme that represents exposure to all the Digital 4.0 sub-themes – without storage none of this can function. What fascinates us is that 90%+ of all data centre storage is done on hard disk drives (HDDs) [8] and yet, the two leading companies in the HDD space [Seagate and Western Digital] are rarely properly credited for that. HDDs, like semiconductors, follow geometric laws, similar to Moore's law. In fact the former CIO of Seagate is well known (amongs HDD geeks at least) for the creation of Kryder's Law. Kryder's Law states that the areal density of a HDD doubles every 13 months – the reality has not quite developed in that way but the geometric progression is clear. Normally, accelerated demand spawns new entrants to markets but in the case of all storage media (HDD, NAND and DRAM), the opposite is true. Supply has rationalised extensively over the last 10-15 years.Alongside the two large HDD players, Seagate and Western Digital, there is a remote third player, Toshiba. This has, in our view, resulted in a rational supply-side dynamic meeting a firehouse of demand. The chart below from Statista shows the expected growth in data creation over the next 15 years. There is just nowhere near enough capacity to store this.

Actual and forecast amount of data created worldwide 2010−2035 (in zettabytes)

1 zettabytes = 1 billion terabytes

2010	2015	2018	2020	2025	2030	2035
2	12	33	47	175	612	2142
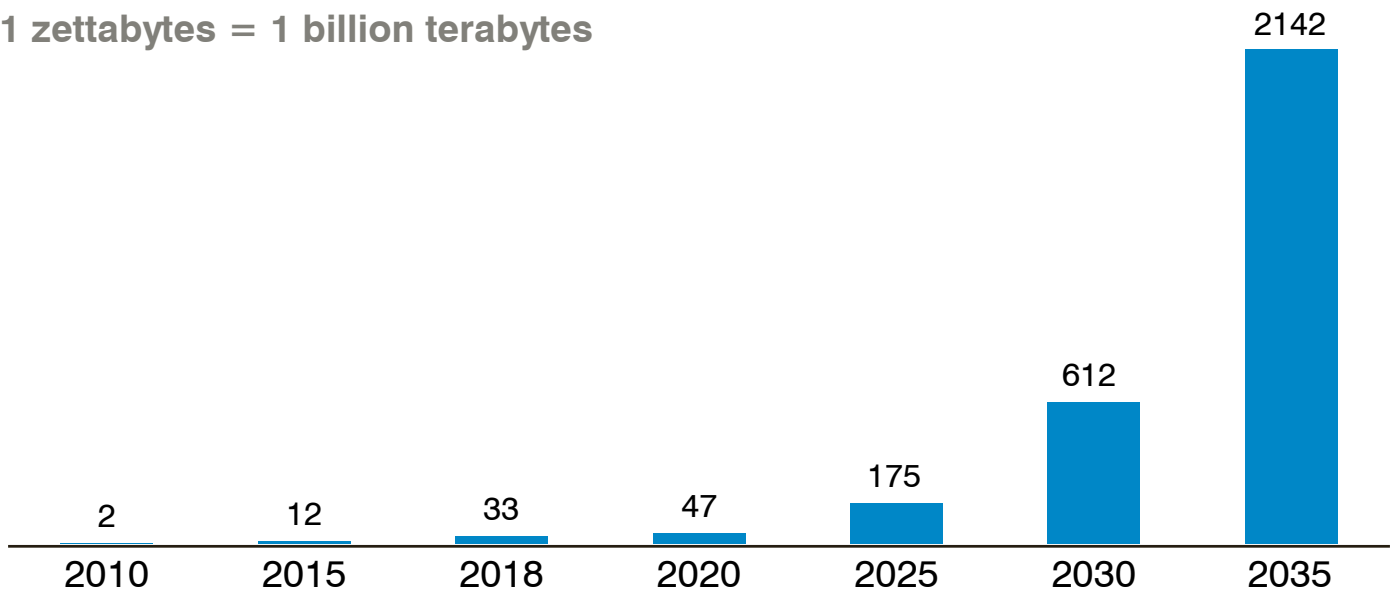
Source: Statista Digital Economy Compass 2019. For illustrative purposes only. There is no guarantee that forecasts will be realised.

The implications are clear. There should remain a strong demand for storage media over all time horizons and given the rational state of the supply side, pricing should also remain rational. In broad terms, we see the demand for HDD storage increasing by 30-35% annually for the foreseeable future; with a tighter supply dynamic, pricing should remain well underpinned. It is very rare to see anything other than pricing falling in line with Moore's law-type dynamics but recently this has changed. In Q3 2021, HDD pricing was flat year-on-year and fell only 5% year-on-year in Q4 2021. This is significant in the context of consensus thinking. Analysts have generally estimated total HDD revenues flat to slightly declining over time as the volume (data bytes) increase is offset by price declines. It is hard to see how

this holds in a world where data creation is growing so rapidly and where the desire to store that data for enterprise productivity is also increasing. While the pricing dynamics of the last two quarters may be dramatically in favour of these companies, an environment where, for example, volume increases were offset by price to the tune of 50% could generate a delta on revenue growth that is totally outside market expectations. It is impossible to predict the exact outcomes but it seems sensible to conclude that consensus is likely far too bearish.

AI and machine learning – Automating the lending landscape
By Kevin Kruczynski

Artificial Intelligence (AI) and machine learning (ML) are among the most transformational emerging technologies and we are in the foothills of seeing these being applied to lending. We think this could lead to a positive situation for both borrowers and the banks.

A generation ago, obtaining a loan was a privilege granted to someone that needed to be on personal terms with the local bank manager, who would be well placed to assess an individual's character and financial circumstances before deciding whether to make a loan. Over the years that level of relationship banking has faded, bank branch networks have receded, while credit has become more ubiquitous, and available to more people than ever. A large part of this transformation has been facilitated by credit reference agencies that use established models to monitor an individual's credit activities to assess their creditworthiness. Typically, a higher credit score will unlock a wider and cheaper array of credit options.

Looking at the US, FICO launched its credit scoring algorithm in 1989, and uses five variables to calculate an individual's credit score – banks then set minimum score thresholds to qualify for prime lending products. This is a well-established system that is entrenched in most lending departments, and until recently there has been little incentive to move on and adopt newer technologies. The major flaw is that perfectly good loan applicants are falling below the threshold, due to the rigidity and biases in the system.It is estimated that 80% of Americans have never defaulted on a credit product, yet only 49% have access to prime lending through the current system.[9] The result is that many borrowers who have the will and means to repay are rejected by the prime system, forcing them to pursue higher priced subprime lending options, while significant revenues and growth prospects are being left on the table by the banks.

Newer AI and ML driven credit scoring approaches are emerging that can more accurately assess an individual's creditworthiness. The latest AI driven models look at over 1500 data points, including data mined from digital footprints and social media. These newer techniques also use more streamlined and up-to-date cloud-based infrastructure that is much easier and cheaper to maintain than legacy systems in place at most banks, making it easier to meet regulatory requirements, and help detect fraud. Analysis by McKinsey [10] shows how banks that have embraced newer lending models have increased revenues by up to 15% and lowered default rates by up to 40%, achieved through a combination of better customer experience, higher acceptance rates, lower customer acquisition costs and default rates. On top of this, there is also the side benefit of more streamlined workflows and processes.

The US alone has over 4000 banks. We believe very few have the scale to develop systems using the latest proprietary technology, and even fewer have the allure to attract the top talent from Silicon Valley. There are some interesting business models emerging. Of these, Upstart appears to be emerging as a key enabler in this field as its platform-based approach starts to reach a critical mass. The company was formed 10 years ago by former Google employees effectively seeking to disrupt the credit decision making process, based on the premise of applying modern data science and the latest technology to improve outcomes. The number of variables on their algorithms is now over 1500 and growing, this helps feed a virtuous cycle as the more credit issued using Upstart, the more accurate the algorithm becomes, and results so far have been positivewith more borrowers approved and lower loss rates. Rather than keep the loans on their books and take on credit risk, they work with banks who wish to originate credit using their technology. Currently they have 30 banks on the platform and hope to expand this to over 100 within a year or so. Clearly the growth runway remains long, as the more loans approved using their technology, the more evidence of positive outcomes is generated and the more confidence banks will have to embrace it.

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[9] Source: Upstart retrospective study, December 2019.
[10] Source: Designing next-generation credit-decisioning models, McKinsey & Company, 2 December 2021.

Upstart's AI driven Virtuous Cycles
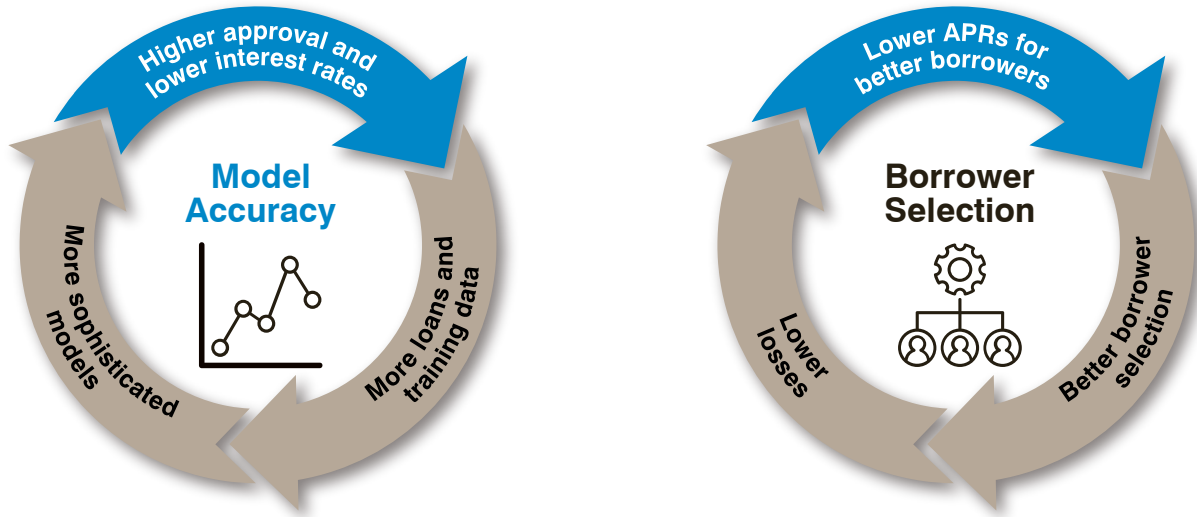
Gamification of Everything
By David Goodman

Gamification as a concept is not new. From boy scouts who obtained real badges and rank back in the early 1900s to school children earning gold stars or executives collecting frequent flyer points, incentivisation and rewarding performance has always been with us. It is only within the last 15 years that it has gained recognition as a driving force that affects almost every aspect of our lives. In its simplest terms, gamification incorporates game-style incentives into non-game activities. It taps into the human need for rewards and pleasure, infusing gaming aspects into a multitude of scenarios, often with benefits to both the supplier and the end user.

Today, thanks to digitisation and ubiquitous mobile devices, the gamification influence can be found everywhere – from businesses using it to create brand loyalty or boost staff performance, to educationalists looking to improve student engagement; from the fitness industry seeking to encourage people to exercise, to the US army using it to recruit. Game mechanics is about applying a game layer on top of the real world and it is literally all around us, incorporating game design elements and game mechanics into existing experiences and platforms to drive user engagement, participation, interaction and productivity.

Gamification – why it works

By incorporating game-style incentives into non-game activities, gamification leverages the fact that a good number of people have an innate enjoyment for competition, achievement, collaboration and charity. Indeed, many of the tools used by game designers have been adopted, including badges, leader boards and 'levels.' By offering fun and rewards following performance-based activity, gamification can make aspects of the daily routine more enjoyable.

And fun is at the heart of why we believe gamification works.

A classic example of harnessing gamification to motivate people was the 'Piano Stairs' case study, part of a viral marketing campaign called The Fun Theory created by Volkswagen Sweden, that took place at Odenplan subway station in Stockholm, Sweden in 2009. The aim was simply to get people to burn more calories by taking the stairs instead of the escalator – so tactile piano keys were placed on the stairs which allowed people to create music as they walked. By making the experience more fun, the result was a 66% increase in people taking the stairs.

Source: Getty. For illustrative purposes only.

Gamification – how is it used?

Big business

Businesses have long used gamification techniques such as rewarding users for 'achievements' and providing points for use in the real world to great effect; frequent flyer programmes and loyalty shopper points have proved a highly successful tactic in achieving customer loyalty and are easily measured.

A great example of loyalty points in action is Starbucks' Rewards app – thanks to digitisation the company has taken the basic idea and moved it to another level, achieving one of the most successful reward programmes of all time. Replacing the traditional paper cards, the app works on a completion system, with customers earning points towards bigger prizes whenever they make purchases. In Q1 2022 the company reported Rewards growing at 21%, to a record 26.4 million 90-day active members – both Starbucks and its customers clearly like the app.

It's not just about the money

Encouraging consumers to spend is only one aspect of gamification as an engagement tool - it is widely used to incentivise too, for example:

In the workplace…

In a work environment, gamification can be used to increase productivity by tracking performance, setting goals, encouraging friendly competition and improving the atmosphere - with employees rewarded for giving their best effort.
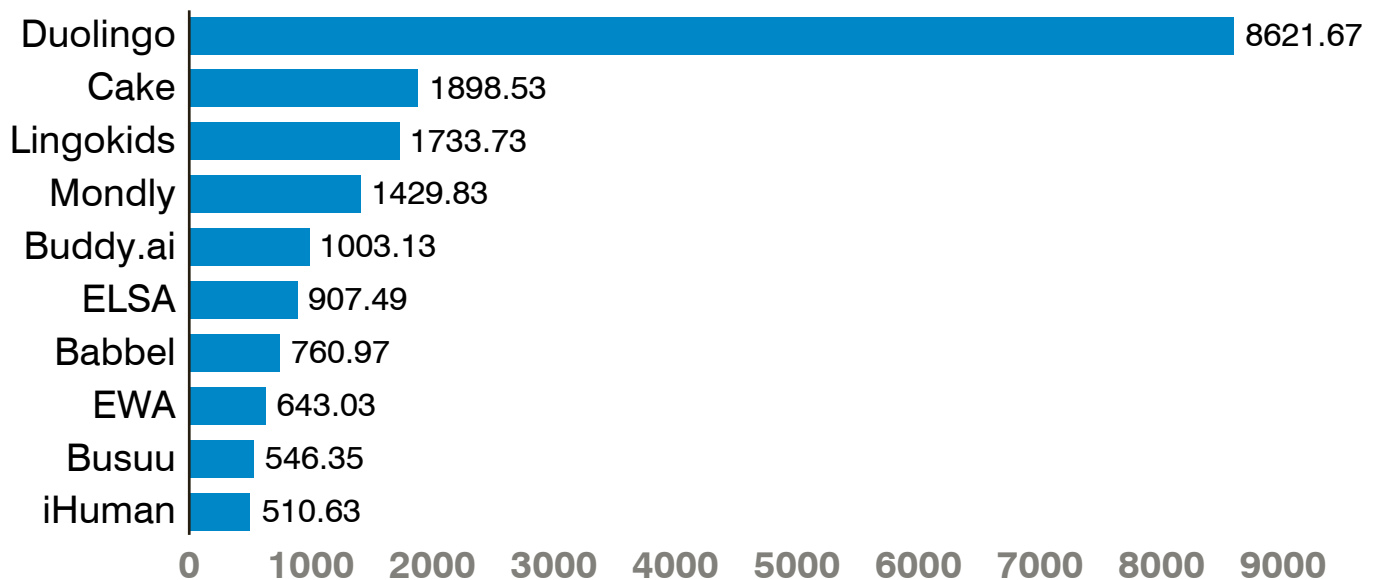
Keeping fit…

Gamification has been widely adopted by the fitness industry to encourage people to exercise more. One of the best and earliest examples is the Fitbit smartwatch, where users can track their exercise, undertake daily challenges, compete with friends and are rewarded with badges for milestones achieved. Largely successful, Fitbit's gaming aspects have moved on, with provision of a health metrics dashboard, advanced sleep score analysis and wellness reports on latest health trends.

Learning by playing…

Applying games mechanics has brought multiple benefits for educational purposes too. For example, the language app Duolingo makes learning easier and more fun by providing language challenges for users to play, with points given for practice and results that can be shared with friends.

The stats speak for themselves. "In February 2022, Duolingo was the most popular language learning app worldwide based on monthly downloads, with more than 8.6 million users downloading the app to their mobile devices during the month. Language learning apps focusing on English as a foreign or second language were also popular, with Cake amassing roughly 1.9 million downloads, and children-specific app Lingokids ranking third worldwide." (Statista - L. Ceci, 22 March, 2022).

Leading language learning apps worldwide in February 2022 by downloads (in 1,000s)

App	Downloads
Duolingo	8621.67
Cake	1898.53
Lingokids	1733.73
Mondly	1429.83
Buddy.ai	1003.13
ELSA	907.49
Babbel	760.97
EWA	643.03
Busuu	546.35
iHuman	510.63

Source: Top language learning apps by downloads 2022 | Statista. For illustrative purposes only. Not to be construed as a recommendation to buy or sell securities or investment advice.

Speed Camera Lottery

Over in Stockholm, they have even gamified speeding. A speed camera lottery was devised in 2011, also as part of The Fun Theory marketing campaign, to get people to obey the speed limit for fun, with the speed camera doing two things: 1) It photographed speeders and gave them a fine, with the money going into the lottery pot. 2) Those who obeyed the law had their photo taken and this was entered into a lottery to "win" a share of the pot. The average speed before the experiment was 32km/h, while during the experiment it was 25km/h – a reduction of 22%.

Source: Getty. For illustrative purposes only.

But gamification is not always appropriate…

The trading app, Robinhood, has gamified investing by making the investment experience akin to playing video games. Digital Confetti (now removed) would drop across the screen every time a trade was made, with the consequential hit of dopamine encouraging investors to engage with the app and trade more.
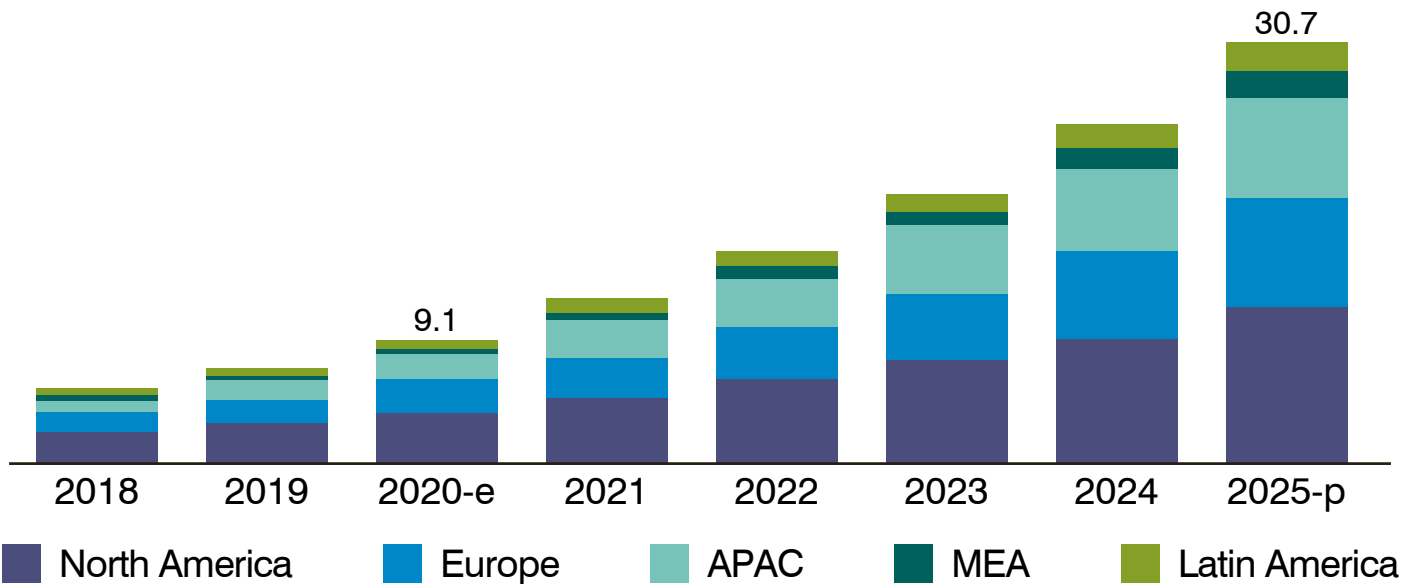
While making investing more fun seems like a good idea at first glance, in practice manipulating investor behaviour has come under scrutiny by the regulators. In August 2021 the US Securities and Exchange Commission issued a formal request to the public on investing gamification and "digital engagement practices".

Going forward - by the numbers

The expectation is that the world will continue to see increasing demand for gamified systems, with the global gamification market projected to grow from USD 9.1 billion in 2020 to USD 30.7 billion by 2025, at a compound annual growth rate (CAGR) of 27.4%.
(https://www.growthengineering.co.uk/19-gamification-trends-for-2022-2025-top-stats-facts-examples/).

Gamification Market, by Region (USD Billion)

30.7

9.1

2018   2019   2020-e   2021   2022   2023   2024   2025-p

■ North America   ■ Europe   ■ APAC   ■ MEA   ■ Latin America

Source: MarketsandMarkets Analysis. For illustrative purposes only. Projections are not actual and may vary widely from the projections shown.

The big players

North America currently accounts for the largest share of the global gamification market and this is predicted to continue for the next five years – driven by the region's dominant number of mobile internet users, with 90% of residents owning a smartphone.

In Europe, gamification is also expected to develop significantly within the next five years, with growth supported by local governments and key stakeholders - for example in the UK and France, policymakers are set to host more gamification conferences and events. Not surprisingly, while North America and Europe will remain the largest players for some time to come, other regions are playing catching up.

Millennials will be key

Critical to gamification's success going forward is how companies interact with millennials. Having grown up in an era of technology, they expect high levels of engagement from brands, products and companies. They take for granted that experiences will be tailored for them, but more than that, they also want to be part of something bigger, something that connects with others and has a purpose, in our view.

On a practical level, gamification can be integrated with e-commerce CRMs and websites and the data it produces is substantial, including valuable analysis. With the capability to provide data on what is working – and more critically, what is not – most organisations would likely welcome this kind of insight into their business and the step up it provides for future benefits.

It is hard to predict the end game, but as digitisation accelerates, gamification, in our view, is likely to be something all industries will be looking at closely to increase both efficiencies and productivity.

Outlook

There has rarely been so much uncertainty in financial markets with the outcome of many market-driving events in a significant state of flux. The war in Ukraine, inflation, supply chains and interest rates all have the potential to significantly affect market developments. It is in precisely this environment that duration or growth assets lead the de-risking process. As the chart at the start of the newsletter shows clearly, there has been an almost total removal of the Covid-led outperformance of high growth names. This is in spite of the structural benefits that the pandemic has delivered to disruptive technologies as they have been more broadly and more rapidly adopted.

It is at this point that we try to stand back and take a measure of perspective. In our view, markets are unforgiving when risk rises and fundamental outcomes are often thrown out in favour of safety and the security of value, cash flows and dividends, and even book values (though we maintain clear concerns over the 'value' of BV in a disruptive and asset light world). We do not have a great deal of history to draw on but the 2008/09 global financial crisis does give us at least one very interesting data point. In the sell off that occurred then, duration and disruptive companies were punished severely in the early phase of the sell down. The new pretenders of the day, like Amazon and Salesforce, fell as much as any name – as much as 70% from peak to trough. However, fundamentally they continued to grow aggressively through the downturn; their disruptive and early stage models could easily weather the overall decline in economic growth. Amazon's revenues grew 29% in 2008 and 28% in 2009. Salesforce's revenues grew 51% and 40% in the same years.[11] Clearly fundamentals were hardly affected. The market was acting as an extreme voting machine not a weighing machine (to quote the Benjamin Graham analogy). The opportunity set up was amazing. Investors who looked through the irrational pessimism at the time could have purchased Amazon shares at USD 34.7 and Salesforce at USD 5.2. The returns to end Q1 2022 on those purchases? 93x on Amazon and 40x on Salesforce! These names also bottomed well ahead of the broader market having sold off more quickly. We believe this is a possible blueprint for today. While timing is never an exact science, the return potential offered by some of the next generation disruptive top performers is currently significant. We believe we are close to if not at the point where risk / reward may favour the brave just as it did for Amazon and Salesforce back in late 2008.

[11] Source: Bloomberg, as at 31 March 2022.

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