



Declining Productivity?

April 2021 – Q1 Explorations

“These reassessments reflected, in part, the persistence of *surprisingly sluggish productivity growth*—both in the United States and abroad—and suggested that fewer federal-funds rate increases would be necessary than previously thought to scale back accommodation.” – Janet Yellen, FED CHAIR in 2017, expressing productivity concerns leading to maintaining low interest rates.

In 2013, U.S. business sector workers worked an identical amount to 1998, 194 billion labor hours, yet produced 42% more output *after* adjusting for inflation¹. That means, on average, a person created 50% more output in 15 years’ time. That is wealth creation! Unfortunately, productivity has been declining of late and it is a source of concern – let’s explore!

This fact pattern belies both the importance of productivity and the concern that economists have with declining global productivity over the last decade and a half. Productivity is one part of the equation – the other part is labor. The demographic trend in the developed world is towards an aging population which points to a lower labor force participation rate in the future (note our [2019 Q2 Explorations](#) on Demographics). With expected increased stresses on labor force size², real productivity is key if we want GDP to increase at a reasonable rate. And we do want this! Productivity growth is a major driver of increased wealth and quality of life.

Gross Domestic Product (GDP) = the total value of goods produced and services provided by a country’s labor force

$$\text{GDP Growth} = \text{Labor force growth} * \text{output growth (aka productivity growth)} * \text{inflation adjustment}$$

Unfortunately, most of the growth highlighted above came in the early part of the period of 1998 to 2013. As can be seen in the two charts on the next page, productivity has been anemic over the last thirteen years – especially when it comes to manufacturing.

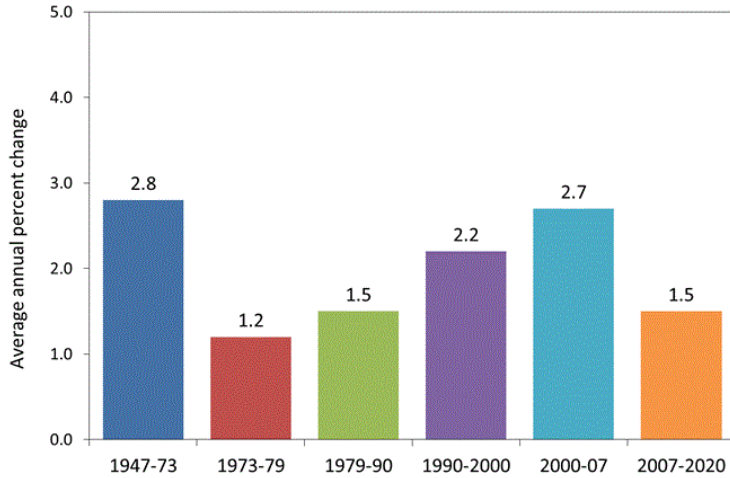
¹ [What can labor productivity tell us about the U.S. economy?: Beyond the Numbers: U.S. Bureau of Labor Statistics \(bls.gov\)](#)

² A rabbit hole of thoughts: (1) Immigration is a necessity. The US is in great position here given its continued pole position on so many positive characteristics (best college system in the world, entrepreneurialism, freedom, capitalism). China is not close and has a way worse demographic issue – we discuss this in our Q2 2019 Explorations on demographics! (2) From 1998 to 2013, average hours worked dropped 5% (from 1840 to 1750) ([Working Hours - Our World in Data](#)) – was this good? – a continuing trend of less work and more play – or bad? – a sign of the gig economy and too much control at the top – discuss!



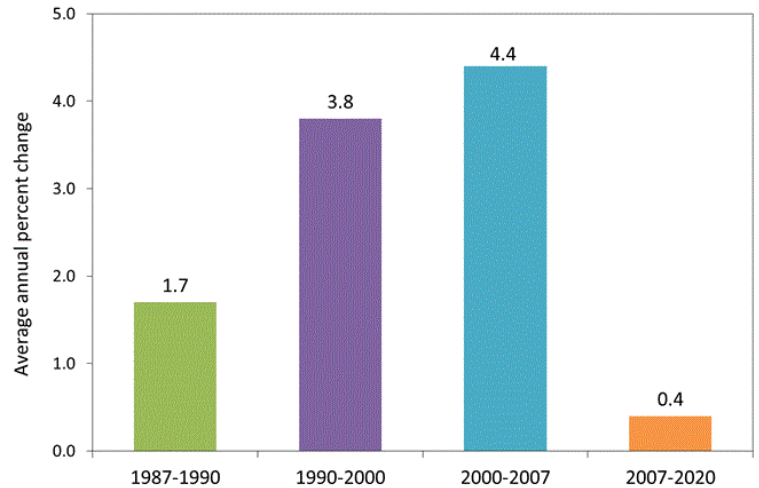


Productivity change in the nonfarm business sector, 1947-2020



Source: U.S. Bureau of Labor Statistics

Productivity change in the manufacturing sector, 1987-2020



Source: U.S. Bureau of Labor Statistics

How exactly is productivity defined and why has it been so lackluster as of late? After all, it seems like there has been tremendous innovation over the past couple of decades.

Productivity Defined

Luckily, a long-term trend for humanity has been growth in productivity! Agriculture tells the story well. Since humans became agrarian only very recently, the vast majority of people were subsistence farmers³ – serfs and peasants as examples. Since the land provided just enough for their own family (and many times not even that), wealth creation was difficult. Some areas had it easier than others. For example, the Nile river was nice enough to overflow its banks in just the right way to allow an abundance of food in that region, while the immediately surrounding region was more hostile, creating an attendant defense for the people of the Nile. Europe had larger domesticated animals and generally better land which allowed for higher productivity per person as compared to China, which favored rice due to the crop’s hardiness (China’s large population is most likely due to the need for huge amounts of people for public works such as taming the Yangtze).

“Labor productivity is a measure of economic performance that compares the amount of goods and services produced (output) with the number of labor hours used in producing those goods and services. It is defined mathematically as real output per labor hour, and growth occurs when output increases faster than labor hours.”⁴

³ I did not fact check this but feel rather confident that this is accurate

⁴ [below-trend-the-us-productivity-slowdown-since-the-great-recession.pdf \(bls.gov\)](https://www.bls.gov/news.release/press/2013/09/20130916.pdf)

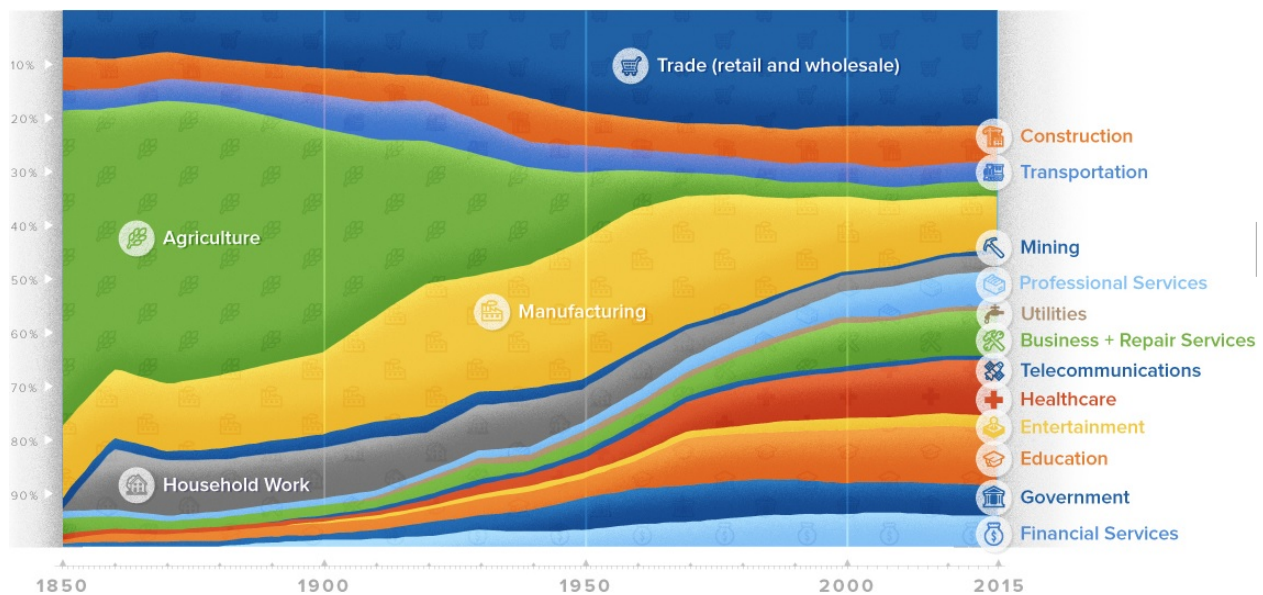


As innovation slowly and then very quickly increased, productivity went through the roof. For example, if the equation in the late middle ages was 1 farmer per acre, then 1,000 farmers can produce 1,000 acres worth of food. If today, 3 farmers and some farm equipment can manage 1,000 acres well then productivity increased over 33,000%. And if Monsanto and the like create optimal seed, spray, and fertilizer resulting in 3x the yield⁵ then we are approaching 100K% increases in productivity!

Meanwhile, some of those 997 farmers moved to the city and got jobs at factories which went through a similar process of innovation and productivity. A country can increase the productivity of its citizens simply by moving them to more productive jobs (note China over the last few decades). The equation remains the same – labor * productivity.

To understand the productivity story, simply view the following graphic. Agriculture, in green, dropped from 60% of jobs in the US to 3% of jobs. Essentially, food production has grown dramatically while our farmer population had dropped precipitously...

150 Years of US Employment History⁶



Productivity on its own has resulted in more food and resources, better health care and housing, incredible consumer products, and materially better living standards than past generations could have ever dreamed of.

⁵ Read *Animal, Vegetable, Junk: A History of Food, from Sustainable to Suicidal* by Mark Bittman for why perhaps this is a bad thing.

⁶ [Chart: Visualizing 150 Years of U.S. Employment History \(visualcapitalist.com\)](http://visualcapitalist.com)

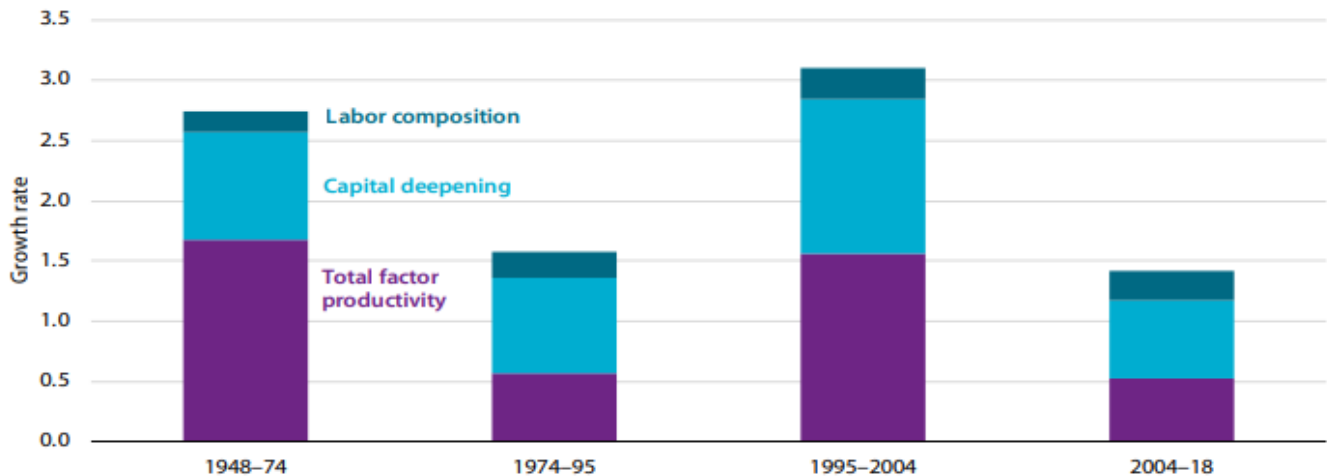


Productivity Growth Components and Implications

There are a number of broad factors that contribute to country-wide productivity growth. These factors are worth defining to best understand growth due to innovation:

- **Labor Composition:** This measures the shifts in age, education and gender. An increase in education generally results in increases in productivity.
- **Capital Deepening (Investment):** Investment in technology/ machinery in an attempt to increase output per worker. For example, adding machinery and tools to a motor vehicle plant will most likely allow workers to increase output per hour.
- **Multi Factor Productivity (AKA Total Factor Productivity; MFP, TFP):** I believe this is where the U.S. really excels! Where understanding and imagination truly takes a role. MFP reflects changes in management practice, organizational change, network effects, general knowledge and all those intangibles not captured in Labor Composition or Capital Deepening. In fact, it is calculated by subtracting the first two, which are easier to compile, from overall productivity growth. Henry Ford's decision to create the assembly line would fall under this category while any machinery he may have purchased would fall under Capital Deepening.

Components of U.S. Labor Productivity Growth, 1948–2018



Source: BLS 2020c; authors' calculations.

Note: Data are for the private nonfarm business sector. The contribution of total factor productivity (TFP) is output per unit of combined labor and capital inputs. The contribution of capital deepening is capital services per hour multiplied by capital's share of current dollar costs. The contribution of labor composition is labor composition multiplied by labor's share of current dollar costs. Labor composition measures the effect of shifts in the age, education, and gender composition of the workforce. The figure shows the compounded rate of change calculated from the index level values in the start and end years of each period.



Part of the tremendous growth in China over the last few decades was a shift from agriculture to industrial work. China spent enormously (Capital Deepening) to create manufacturing and transportation hubs. Over the last thirty years, agriculture has fallen from 60% of Chinese employment to 30% while industry rose from 28% to 46%⁷. Labor shifted from low to high productivity sectors. There has now been a move towards service-oriented jobs which are not as productive,

⁷ [China, a low-productivity superpower | The Interpreter \(lowyinstitute.org\)](https://www.interpreter.org/China-a-low-productivity-superpower/)



and which have been more protected generally by the Chinese government. China's growth may come under tremendous pressure if in fact regionalization is a trend (which we discuss in our [2019 Q3 Explorations](#)), demographics are in decline (discussed in our [2019 Q2 Explorations](#)) and general financial and political governance constraints remain along with potential U.S. pressures.

Why Hasn't Perceived Innovation Translated into Productivity?

"You can see the computer age everywhere but in the productivity statistics" – Nobel Laureate Robert Solow (1987)

There are a few theories here for why we are going through a period of low productivity despite perceived dramatic and disruptive innovation⁸:

- Patience! There is a productivity J-curve. It simply takes time for the work force to incorporate new technology productively
- Measurements of productivity are being undercounted especially when it comes to digital goods and services
- Innovations have been beneficial personally but not professionally

Here at Fountainhead, we have our very own J-curve event. We are currently implementing a new order management system at Fountainhead. This new system will create incredible efficiencies. It will essentially cut out major administrative tasks while dramatically enhancing auditing, reporting and communication functions. There is no question it will contribute to material productivity growth at Fountainhead! However, our productivity has recently declined (we are a team of analysts – trust me!). It has declined temporarily as we learn and implement this system. This is the J-curve. When our productivity increases, part of it will be due to Capital Deepening, as we purchased software and consulting, and part of it will be due to MFP as we develop best practices and further innovate around the power of the platform. Innovation takes time to translate. We see firsthand evidence of the productivity J-curve theory for lower current productivity as we continue to grow as a firm.

The complexities of today's world may also contribute to an undercounting of productivity. After all, how is ad generation on Google translated into a potential productivity measurement? It is definitely more complex than noting the change of revenue vs. labor at a manufacturing plant. Many pundits believe that this is indeed contributing to a potential undercount of productivity but none of them see it as too material.

The concept, though, of recent innovations providing more benefit to one personally than professionally, as well as perhaps the negative effects of some of these technologies blurring the work-home balance, resonates as well. Personal and professional lives are becoming more intermingled than ever. Perhaps we simply need a J-curve for humanity that will allow us to digest the changes and hopefully move on more productively and better for it (note [prior concerns in regard to social media](#) and its effects on society).

⁸ [Understanding and Addressing the Modern Productivity Paradox - MIT Work of the Future](#)



Ultimately, it is most likely a combination of a few of the theories outlined above along with the fact that there has been a shift from higher-productivity manufacturing to lower-productivity service sectors in the U.S.

Future of productivity

I imagine if one presented to a farmer 400 years ago the concept that the world could be fed by 5% of the population, that farmer would assume that most people would simply be out of work. They certainly would not have envisioned the tremendous variety of jobs found today. Simply looking at 150 years of American history provides an obvious lesson in human creativity, as we've generated more tasks for us all to do and get paid for. All this productivity also creates wealth which leads to demand and further innovation. So, we are not quite as concerned about the impending doom of job loss due to robots (Innovation covered in Q4 2019 Explorations), though there may be some concern about wealth inequalities associated with technology. New jobs will continue to be created (e.g., personal photo curator!).

DO WE WORK HARD OR HARDLY WORK?

HARDLY WORK: One century ago, the average work week was 50 hours compared to 40 hours now⁹. For most of history, workers received at most 1 day out of 7 off. This changed in the early 1920's when a 5-day workweek was provided as a Christmas present to the staff of the Rochester Can Company, resulting in an impressive uptick in productivity. Ford copied the approach four years later and the rest is history.¹⁰

WORK HARD: I doubt that the 50 hours worked 100 years ago was randomly assigned across all hours of the week – or that a work alert and notification system (i.e., an iPhone) was attached to each worker allowing one to never stray too far from work. **Is it possible that productivity is declining despite less hours? and that burnout is increasing?**

⁹ [Productivity Framing LO 6.16 FINAL.pdf \(brookings.edu\)](#)

¹⁰ The Long Fight to Take the Weekend Off by Amanda Foreman Page C5 WSJ April 3 - 4

¹¹ [Recovering labor productivity growth | McKinsey](#)



Perhaps the most recent rash of innovations, primarily surrounding digitalization and communication, had a larger effect on personal quality of life without necessarily increasing work productivity. Perhaps some of these innovations have contributed to lowering productivity by further blurring the line between personal and business. What we are certain about though is that innovation and productivity growth will continue. Innovating is in our DNA. As such, we expect it is simply a matter of time before productivity growth picks back up. Given an expected aging of our global population and perhaps a slow down in capital spend due to the massive debt incurred to date, it will definitely be needed in furthering our collective wealth and quality of life.

Significant productivity-boosting opportunities exist across sectors

Examples

Purely digital opportunities

Automotive	Finance	Retail	Tech	Tourism	Utilities
Operational efficiency improvements					
<ul style="list-style-type: none"> Predictive maintenance Advanced robotics 3-D printing Electric vehicles Continued operational improvements and global platforms 	<ul style="list-style-type: none"> Compliance, back- and front-office automation Branch consolidation 	<ul style="list-style-type: none"> Goods handling with robotics/drones Automated checkout In-store and warehouse operational improvements and inventory optimization Continuing store mix shift to more productive large formats and chain stores 	<ul style="list-style-type: none"> Predictive maintenance Testing with machine learning Continued benefits from zero marginal cost in software 	<ul style="list-style-type: none"> Predictive maintenance Automation Reservations apps Continued consolidation potential (e.g., hotels) 	<ul style="list-style-type: none"> Smart grids and meters Drones for inspection Route optimization and bundling inspections Energy storage
Enhancing value added					
<ul style="list-style-type: none"> Autonomous driving Continued shift to premium cars 	<ul style="list-style-type: none"> Digital wallets Innovative payment methods 	<ul style="list-style-type: none"> Customer targeting/bundling via data analytics 	<ul style="list-style-type: none"> Wearables technology Voice-activated assistants and aids 	<ul style="list-style-type: none"> Revenue and capacity management 	<ul style="list-style-type: none"> Energy management systems in homes/offices
Adoption of new business models					
<ul style="list-style-type: none"> Infotainment and connected car 	<ul style="list-style-type: none"> Mobile and online banking Peer-to-peer lending Blockchain 	<ul style="list-style-type: none"> E-commerce 	<ul style="list-style-type: none"> App stores Cloud services 	<ul style="list-style-type: none"> Shared economy (e.g., Airbnb) Vertical aggregators (e.g., Google Trips) 	<ul style="list-style-type: none"> Customers feeding back into the grid Shift to more productive renewables

Continue to Analyze Effectiveness of the 60/40 Portfolio Given a Low Yield Environment

Our general approach to investing on your behalf is to take a top-down approach in creating diversification of risks and returns in one's portfolio. Let's unpack that. A top-down approach means we start by viewing the high-level investing opportunities. Equities vs. Fixed Income exposure first. Then within equities, U.S., Developed Markets (e.g., Europe & Japan), and Emerging Markets (e.g., less-developed markets like China & India) and so forth. We continue on this path to actual strategy and manager selection. Diversification of risks and returns means we invest in multiple exposures on your behalf in order to increase the likelihood we'll have varied return streams as well as risk streams. Since we do not know with certainty (nor does anyone else to our knowledge) what investment will do best, we attempt to smooth out the experience. We do have biases though.

Fixed income has been a meaningful part of investor portfolios for the last few decades. Beyond potential returns, it was viewed as ballast for a portfolio. However, with risk-free rates still near historical lows despite its recent rally, holding longer term fixed income becomes riskier. Less ballast and less potential for decent returns create a need to find other potential exposures.

We have actively worked on mitigating this risk through a couple of actions: (1) We have generally bar-belled our fixed income sleeve of the portfolio by holding short duration exposure on one side and slightly riskier (but still shorter term





relatively speaking) on the other in seeking to at least match our benchmark. (2) We have actively searched and added satellite positions that provide a variable, rather than fixed, interest rate.

To provide some clarity to our concerns, here is the math as we see it: Given 10 year Treasury yields are @ 1%, which is where they were in the beginning of the year, and believing the Federal Reserve's stance that they will not lower rates below 0%, there seems to me an asymmetric risk. If yields increase, once can calculate loss on existing positions by multiplying by duration. So, a 10 year Treasury where yields increase 0.5% results in an immediate 5% loss. If yields stay the same, returns for the year are the aforementioned 1% rate. If yields drop, presumably due to a flight to safety, how far can they really drop given a 0% floor?

We continue to explore methods to reduce the risk we see in the fixed income markets while still capturing the ballast that less risky fixed income securities have provided in recent history when equity markets decline as well as to provide the necessary diversification we seek.

Concerns: *Orchestrating a Perfect Landing*

Covid is an historical event. The government responded decisively. We are now hopefully working our way back to a full economy. Given historic easing actions (low federal funds rates, asset buying programs, massive government programs), there have been concerns about inflation. Given how large our economy is and how disruptive Covid has been, we are discussing massive moves one way or another in the economy. We love the perfect story but the degree of difficulty of landing this perfectly seems extremely high. Maintaining easing policies too long results in inflation. Tightening (e.g., raising interest rates, stopping purchase programs, increasing taxes) too quickly can throw an economy in turmoil. The belief is there is more risk in tightening too quickly. Either way, it seems there will be stress in at least one direction.

General Market Review: *Does Massive Government Spend Point to Inflation? to Asset Bubbles?*

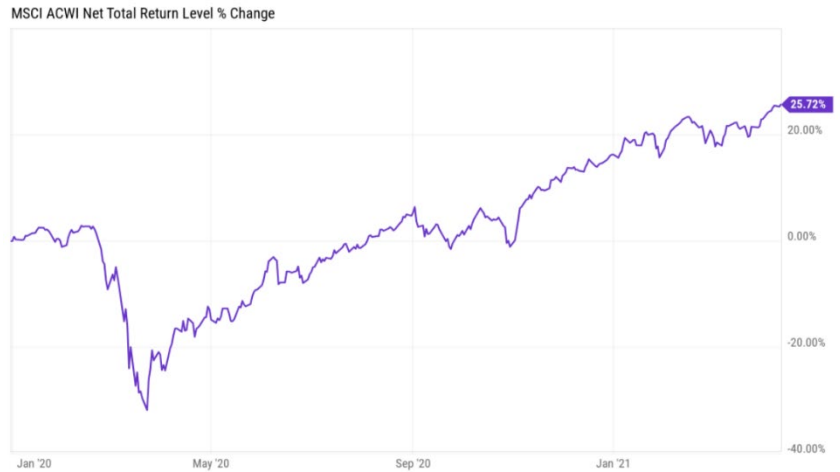
Trillions of dollars of injections into the markets have created, in our opinion, some asset bubbles. A still partially closed economy and potential boredom may have assisted in some of the speculative nature/ gambling in pockets of the market - notably GameStop, though SPACs and NFTs are other examples. A quirk worth noting is the fantastic market return over the last 12 months. Jason Zweig of the Wall Street Journal noted this in his most recent Intelligent Investor column. Much of the investing community tend to look at 1 year, 3 year and 5 year returns. Well, the 1 year return just reset where it no longer takes the market drop due to Covid into consideration - just the pop! As a result, it is an

MSCI ACWI Net Total Return Level % Change





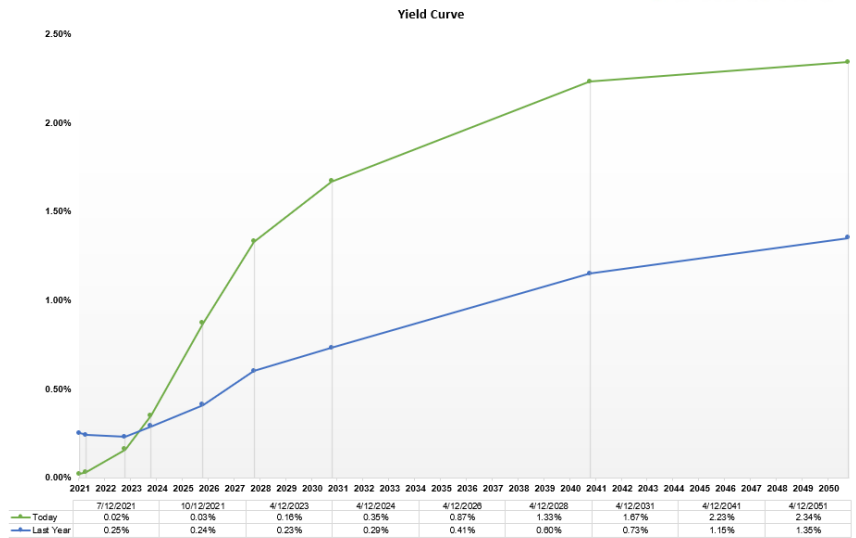
opportunity for more aggressive funds and marketers to highlight fantastic returns over the last year without focusing on that pesky Q1 2020 result. Just note that the Global Index topped 50% performance over the last 12 months! Given this consideration, we have added this top chart on right showing performance over the last 15 months, which shows the index still generating a nice 25% return but also shows the volatility experienced on the ride.



A relatively large increase in yields amid some inflation concerns, as can be seen in the bottom chart, has been the main contributor to any real volatility this quarter. The Federal Reserve really does control the front end of the curve and given the relationship between different maturities, it is hard to see rates increase too much more – but this friction generally results in volatility as something has to give.

Report Created on 04/12/2021

YCHARTS



The massive debt load globally, as discussed in recent [Explorations](#), and the fact that the world’s population, especially in developed markets, is becoming older on average, results in large overhangs that seem likely to have negative effects at some point in time – when, who knows?

Countering this narrative are the amazing innovations occurring continuously in society that hopefully result in further productivity and value creation as discussed in this Exploration.

Both the debt load and aging populations are significant contributors to the low yield environment we are currently experiencing. As mentioned above, with yields at historical lows and a stated lower bound of 0% interest rates by the Fed, the risk/reward on fixed income has shifted in our minds after a 30+ year bull market.

Suffice it to say, financial markets are and will always be incredibly complex. We continue to monitor markets closely and look for opportunity on your behalf from both a risk mitigation and return perspective.

IMPORTANT DISCLOSURE: The information contained in this report is informational and intended solely to provide educational content that we find relevant and interesting to clients of Fountainhead. All shared thought represents our opinions and is based on sources we believe to be reliable at the time of publication. While we continue to make these reports available, we do not update past reports in light of subsequent events. Nothing in this letter should be construed as investment advice; we provide advice on an individualized basis only after understanding your own circumstances and needs.