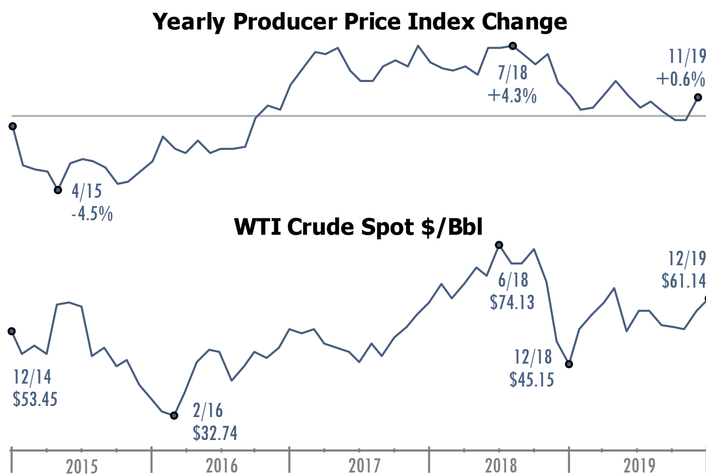
Bellwether
CONSULTING

Your Quarterly Update on the Financial Markets
December 31, 2019

MARKET Recap

The US Economy: "All Ahead Slow"

The US economy continued to grow at a 2.1% annual pace in the third quarter, slightly faster than it did in Q2. Personal consumption expenditures remained strong, while business spending (nonresidential fixed investment and private inventory investment) continued to slow. However, the negative contribution from business spending was much smaller than in the previous quarter. Both imports and exports increased.



Inventory spending by manufacturers picked up in Q4 through November, just as new orders for US manufactured durable goods dropped 2% from October, following relatively slow 0.2% growth in October. Demand declined for transportation equipment, machinery and primary metals. As of October, the seasonally adjusted inventories-to-sales ratio for manufacturers stood at 1.40, up from 1.34 one year prior. This level is relatively high but not unprecedented; throughout the early 1990's, inventory ratios exceeded 1.60, but have averaged 1.30 since 2000. November advance retail sales estimates were up year-over-year, portending a jolly holiday season. Additional contraction in inventory levels should be expected, and it could accelerate if any weakness in final demand appears. However, if personal consumption remains strong, current expectations of continued slow growth may prove reasonable.

At its December 10-11 meeting, the Federal Open Market Committee confirmed the end of its recent easing cycle with its third consecutive 25 basis point cut on October 30th. Throughout its report the Fed cited slowing global growth and persistently low inflation in the United States. To a certain extent, oil prices have provided a counterweight to upward pressure on wages with historically low unemployment. Global oil supplies are now more elastic than in the past, due to North America shale and sand capacity which has placed a soft ceiling on crude prices. Historically, global conflict has tended to transmit inflation through oil prices, which have been sensitive to geopolitics. As if on cue, US military action in Iraq may provide our first test of conflict sensitivity in the "shale era." This is something we will keep a close eye on this year.

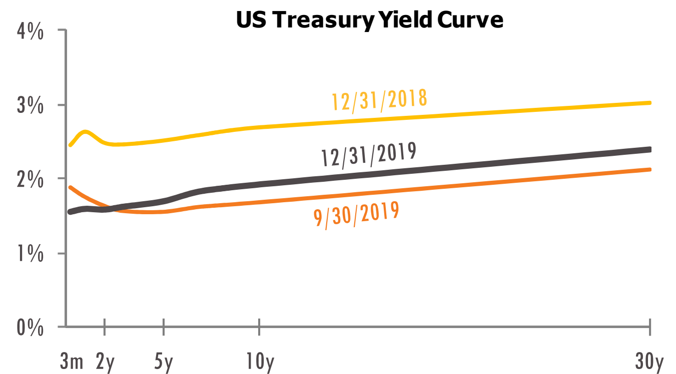
As for global growth prospects, the World Bank released its widely-followed Report on Global Economic Prospects in June. Revised forecasts are somewhat muted for the next several years, as growth expectations were reduced for emerging markets generally, and Europe specifically. A variety of reasons are cited, but looming large is the expected impact of reduced global trade stemming from US trade policy under the Trump administration. The Federal Reserve published a study in December finding that US tariffs have not boosted manufacturing employment, even as they have increased producer prices. Tariffs are a lose-lose proposition, and the negative impact on economic progress is expected to be spread throughout the world, not confined to the conflicting countries.

World Bank Growth Forecasts (Real GDP)

(percentage change from previous year)	2015	2016	2017	2018e	2019f	2020f	2021f
World	**2.9**	**2.6**	**3.1**	**3.0**	**2.6**	**2.7**	**2.8**
Advanced Economies	**2.3**	**1.7**	**2.3**	**2.1**	**1.7**	**1.5**	**1.5**
United States	2.9	1.6	2.2	2.9	2.5	1.7	1.6
Euro Area	2.1	2.0	2.4	1.8	1.2	1.4	1.3
Japan	1.2	0.6	1.9	0.8	0.8	0.7	0.6
Emerging Market & Developing Economies	**3.8**	**4.1**	**4.5**	**4.3**	**4.0**	**4.6**	**4.6**
Commodity-exporting EMDE	0.8	1.5	2.1	2.2	2.1	3.1	3.0
Other EMDE excluding China	5.2	5.1	5.4	4.9	4.2	4.8	5.0
China	6.9	6.7	6.8	6.6	6.2	6.1	6.0

The US Bond Market

Halloween marked a spooky end to the Fed's latest string of policy target rate changes, which pushed overnight rates lower by 75 basis points over the course of 3 months. Without any further FOMC action on the horizon, the yield curve escaped the Fed's influence to resume a normal slope across all major key rate tenors. The 10-year steepened 29 basis points against the 2-year, but only 10 basis points against the 5-year. Despite the economic optimism connoted by a rising, positively-sloped yield curve, yields remain well below where they began 2019. The message is unclear. Is the bond market still anxious of a near-term recession or have we transitioned to a new normal?



Fixed income investments held up well to rising yields in the fourth quarter. Long duration government debt was the only area of the market where rising yields proved too strong a headwind for a landing in positive territory. Credit spreads contracted modestly, leading high yield to outperform. Long-dated, lower-quality issues had a banner year in 2019. Investment grade US corporates managed to nuzzle up even closer to Treasuries at an options-adjusted spread of just 101 bps, tighter by 21 bps. High yield spreads ended the quarter tighter by 42 bps to close at 3.60%. Investment grade bond issuance was steady through the end of the year, and high yield issuance finished strong, overshooting the fourth quarter of 2018 in October alone.

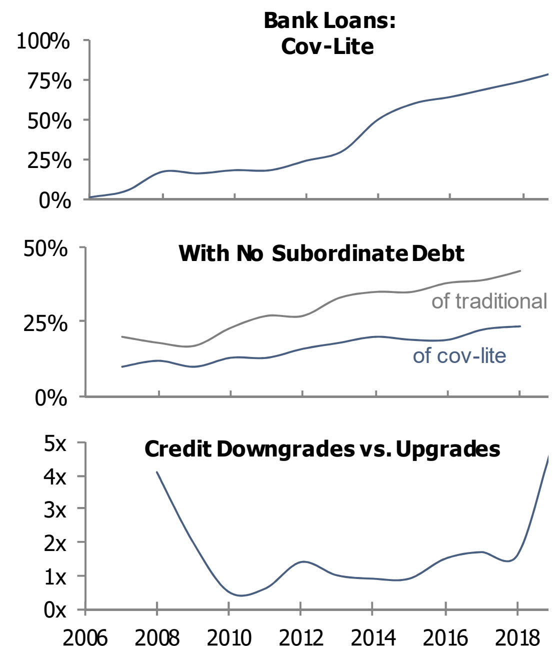
US Bond Indices - Total Returns

Blmbg Barclays	4Q19	2019
Aggregate	0.18%	8.72%
Short Gov't	0.61%	3.29%
Interm. Gov't	0.01%	5.20%
Long Gov't	-4.06%	14.75%
TIPS	0.79%	8.43%
Municipal	0.74%	7.54%
Interm. Credit	0.98%	9.52%
Long Credit	1.18%	23.36%
High Yield	2.61%	14.32%
Bank Loans	1.68%	8.17%
MBS	0.71%	6.35%

Although tight credit spreads and relatively stable yields indicate that most of the US fixed income world is on solid footing, some negative headlines plagued the bank loan market in the fourth quarter. Prior to the 2008 financial crisis, bank loans were a roughly $500 million market of mostly BB-credit-quality floating rate debt issued mainly by utilities, automotive, and publishing companies. The market has grown to about $1.2 trillion; tech and service companies now lead origination volumes. Less than one-third of bank loans have been BB-rated since 2017. Following the deterioration in credit quality, banks have been getting stuck with billions of dollars in loans that investors have failed to absorb over the past year [S&P Global].

In many ways the bank loan market is similar to the oft-maligned mortgage-backed securities (MBS) market. Most bank loans are purchased for a collateralized loan obligation (CLO) that restructures the individual securities into a diversified series of tranches of varying credit quality. However, with 2008 in rear view, hindsight has afforded the wisdom that countless CCC-rated debt cannot be repackaged as a perfectly safe investment. Accordingly, CLO managers have generally been hesitant to load up on low-credit quality bank loans due to a better understanding of the limitations of financial engineering, increased scrutiny, and expectations that CCC loan supply will increase. However, there are some CLO managers who have begun issuing "enhanced CLOs" which may contain up to a 50% allocation to CCC+ or below. This is a significant departure from the standard limit of 7.5%.

Amid rapid growth, the leveraged loan segment has fallen under increasing scrutiny from a range of regulators over the past couple of years. A recent report by the Financial Stability Board (FSB) suggests that vulnerabilities in the leveraged loan and CLO markets have grown since the 2008 financial crisis. Bank loan advocates would argue the securities are inherently less risky than mortgages because corporations face higher standards and detailed audits to access financing. Additionally, the loans sit atop the capital structure in terms of seniority, are collateralized, and tend to have more covenants than high yield bonds. Yet, approximately 80% (and growing) of loans outstanding are covenant-lite, meaning they could offer lenders and investors less protection than traditionally structured credits. Further yet, more loans than ever have no subordinate debt.

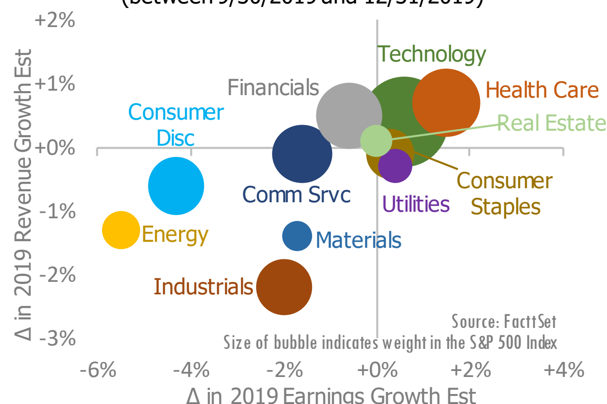


The US Stock Market

The US stock market posted strong returns for the fourth quarter and closed 2019 with all but record-setting results for the year. Despite a volatile 12 months driven by trade tensions, the S&P 500 and the NASDAQ Composite each turned in their best annual performance since 2013 as China and the US reached an agreement to avoid a further escalation of tariffs.

US Stock Indices - Total Returns					
Large-cap Stocks	**4Q19**	**2019**	**Mid-cap Stocks**	**4Q19**	**2019**
S&P 500	9.07%	31.49%	S&P Midcap 400	7.06%	26.20%
Russell 1000	9.04%	31.43%	Russell Midcap	7.06%	30.54%
Growth	10.62%	36.39%	Growth	8.17%	35.47%
Value	7.41%	26.54%	Value	6.36%	27.06%
Broad Markets			**Small-cap Stocks**		
S&P 1500	8.92%	30.90%	S&P Smallcap 600	8.21%	22.78%
Russell 3000	9.10%	31.02%	Russell 2000	9.94%	25.52%
Growth	10.67%	35.85%	Growth	11.39%	28.48%
Value	7.48%	26.26%	Value	8.49%	22.39%

While good news on the trade front certainly had a positive impact, stock market performance tends to be more heavily influenced by central bank policy, and a large part of the 2019 rebound was driven by three Federal Reserve interest rate cuts over the course of the year. The rotation into value stocks at the end of Q3 turned out to be short-lived as growth outstripped value across the capitalization spectrum for both the quarter and the year. The Russell 2000 recovered as well, edging ahead of its mid- and large-cap counterparts for the final 3 months of 2019. However, it was not enough to outweigh the relative deficit built up in earlier quarters, and small caps were the laggard for the year despite returns solidly above 20% for each of the major small-cap indices.



US stock market performance belied stagnating corporate earnings. Companies in the S&P 500 reported a year-over-year earnings drop of 2.2% for Q3. A drop of 1.5% is anticipated for Q4, making it the fourth straight quarter of YoY earnings declines if expectations materialize. However, the recent increases in negative guidance abated somewhat. Out of the 107 firms issuing guidance, 72 warned in Q4. This brought the percentage of companies issuing negative EPS guidance below the 5-year average of 70% [FactSet].

Every sector posted a positive return for the quarter. Tech and health care tied as top performers, with tech outstripping all other sectors for the year. The S&P 1500 Information Technology Index posted a 12-month return just shy of 50%. Semiconductors had an especially strong year as the trend toward "smart" consumer products continued and the industry prepared for the 5G revolution. The past decade has seen the tech sector become an increasingly influential part of the stock market. For instance, Apple and Microsoft moved from a share of 8.4% of the total S&P 500 return over the decade to a 14.8% share in 2019 [S&P Dow Jones Indices]. Factors driving performance in the health care sector were less obvious. Investors seemed to put aside their Q3 fears fueled by drug pricing reform and presidential candidate proposals to revamp the health care system and focus instead on positioning for late-cycle stability. Health care costs continue to rise faster than inflation and command an increasing portion of US spending, and in Q4 health care services stocks rallied. As recession fears diminished over the quarter, it was no surprise to see the utilities and real estate sectors return to the bottom of the table. While these sectors generally become more attractive in low interest rate environments, it was not enough to overcome the lure of their growth-sector rivals.

Initial expectations that 2019 would outpace the record-setting IPO market of 1999 did not materialize. A host of issues, starting with a government shutdown and including inflated valuations, lack of profits, and corporate-governance concerns, slowed issuance and increased investor wariness. High profile stumbles by Uber and Lyft as well as the failure by WeWork to come to market overshadowed the success of offerings from Beyond Meat and a group of tech IPOs in the cloud-technology sector. Ultimately, 2019 saw 159 IPOs raising $46.3 billion in proceeds, down from 192 offerings and $46.9 billion raised in 2018 [Renaissance Capital].

S&P 1500 Economic Group Components - Total Returns

Sector	4Q19	2019
Information Tech.	14.21%	49.75%
Health Care	14.21%	20.87%
Financials	9.94%	31.22%
Comm. Services	8.88%	32.24%
Materials	6.49%	23.88%
Industrials	5.91%	29.80%
Energy	5.76%	10.05%
Consumer Disc.	4.80%	27.41%
Consumer Staples	3.58%	27.00%
Utilities	0.50%	25.20%
Real Estate	0.24%	28.04%

0% 5% 10% 15%

Source: Morningstar

International Markets

Global markets ended 2019 on a positive note as the US and China agreed on terms for a "phase one" trade deal. The de-escalation propelled asset prices higher, and a tug-of-war between political conflict and supportive monetary policy paused.

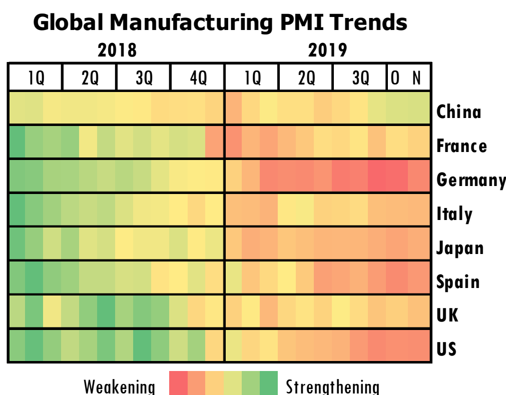
Foreign Stock & Bond Indices - Total Returns

MSCI Broad Indices	4Q19	2019	Barcap Global Indices*	4Q19	2019
MSCI ACWI ex-US	8.92%	21.51%	Global Aggregate	0.49%	6.84%
EAFE (Developed)	8.17%	22.01%	Pan-Euro	1.34%	5.26%
Emerging Markets	11.84%	18.42%	Asian-Pacific	-0.38%	3.69%
			Eurodollar	0.81%	8.81%
MSCI Regions			Euro-Yen	-1.08%	2.94%
Europe	8.84%	23.77%	Other Currencies	3.59%	19.75%
Japan	7.64%	19.61%	** Unhedged*		
Pacific ex-Japan	5.78%	18.36%			
Latin America	10.48%	17.46%			

Europe

Boris Johnson's resounding re-election with 56% of the seats in the British House of Commons brought cheer to equity markets and currency, albeit for a short period. The pound strengthened over 2% versus the US dollar as exit polls indicated a landslide victory for the Conservatives. However, it slumped once the PM reiterated his desire for an exit by December, deal or no deal. While a clear majority should prevent any more domestic delays and indecision, it could increase the volatility of negotiations between the UK and the EU since Johnson is expected to take a more forceful stance.

Other European markets shrugged off local issues to rise in tandem through the fourth quarter. Although German GDP figures in November were nothing to shout about, the 0.1% growth in Q3 helped the world's second largest exporter avoid a technical recession. While the real economy barely posted any growth in 2019, the German stock index (DAX 40) rose almost 26% in the hopes that the slowdown will end in 2020.



Italy, Spain and the UK also posted sharp declines in manufacturing activity (as measured by the Purchasing Managers' Index), while France's expansion slowed. Consequently, the European Central Bank (ECB) kept its key policy rate unchanged at -0.50% during its October and December meetings and reasserted its commitment to purchase €20bn in assets per month to "reinforce the accommodative impact of its policy rates."

In her first press conference, new ECB President Christine Lagarde stated that monetary policy will remain "highly accommodative" as long as inflation remains subdued and growth continues to falter. The ECB expects modest growth in 2020 (1.1%), followed by a slight pick-up in 2021 (1.4%). Inflation projections for 2020, however, remain at 1.2%, well below the 2% target. Weak inflation continues despite strong wage growth, defying expectations.

Americas

Q4 also saw the US House of Representatives pass the US-Mexico-Canada Agreement (USMCA) on trade. Mexican markets reacted positively to the news, ending the quarter up 6.2%. However, most investors expect 2020 to be a tough year as President Andres Obrador continues large public expenditure cutbacks (-2.1% in 2019). Combined with expected lower exports, these factors may weigh on the economy through 2020.

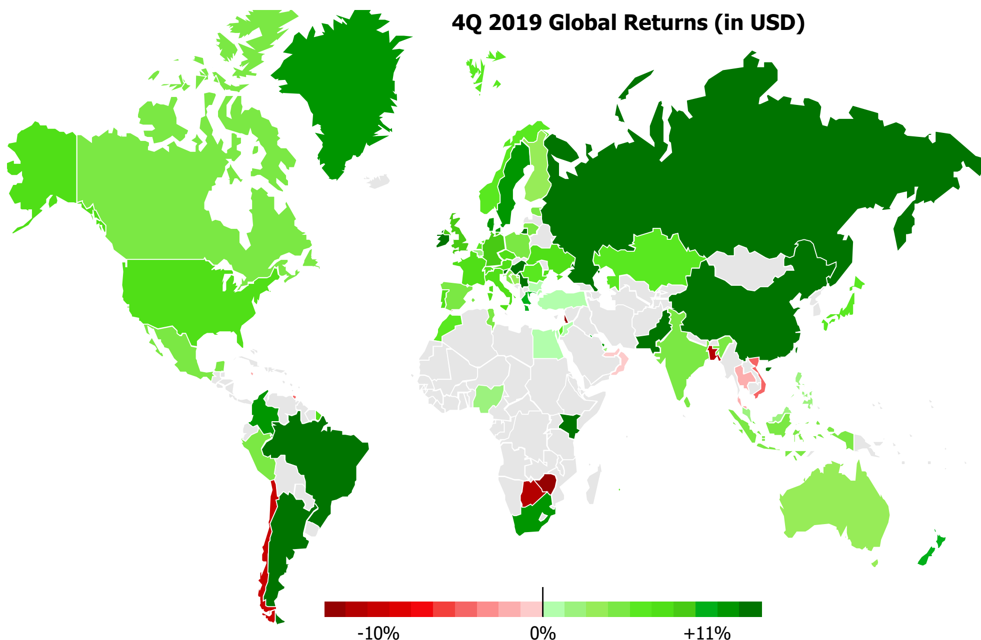
Canadian equities ended the year at record highs. Fears of a local slowdown subsided even as Q3 growth slowed to 1.3% after strong Q2 gains. The Bank of Canada (BoC) expects growth to pick up in 2020 and 2021, driven by rising wages and strong housing demand. As a result, the central bank kept its key interest rate unchanged at 1.75% during its December meeting, noting the resilience of the Canadian economy. The BoC ended 2019 in the minority of central banks – one of the few major monetary policymakers that did not cut rates through the year.

Most South American markets, including Argentina, posted stellar returns in Q4. However, Chilean markets were down dramatically as civil demonstrations, which started in Santiago in response to increased cost of living and economic inequality, soon grew into a countrywide uprising. Chilean equities ended down, over 10% for Q4 and 19% for the year.

Asia

China's mixed economic results continued trickling in through the fourth quarter. Shipments to the US slumped nearly 22% in September from a year earlier, according to the General Administration of Customs. The decline was a major factor, along with a slowing global economy, in the 3.2% drop in total exports. Fourth quarter data showed China's export decline easing slightly. Exports were down 0.9% from a year earlier, better than September's 3.2% decline. Exports to emerging markets and the European Union accelerated, while shipments to the US remained weak. The trade situation

may improve further when December's limited trade agreement between the US and Beijing rolls back existing tariff rates on Chinese goods as part of a deal calling for China to buy $50 billion worth of agricultural goods in 2020, along with energy and other products. In exchange, the US will reduce the tariff rate on many Chinese imports, now ranging from 15% to 25%. Should Beijing fail to make the purchases, original tariff rates would be re-imposed.



Manufacturing showed signs of improvement. China's official manufacturing purchasing managers index came in at 50.2 in November and held steady in December, according to the National Bureau of Statistics. This was the first reading since April above 50, the mark that separates expansion from contraction. The non-manufacturing PMI also improved in November, increasing to 54.4 from 52.8, as services and logistics related to factory production registered big jumps. It fell to 53.5 in December, with the services and construction sectors cooling.

Other key figures, however, showed the economy dragging. Retail sales were up 7.2%, slowing from September's 7.8% pace and missing forecast. Fixed-asset investment in urban areas, a closely watched indicator of construction activity, was up 5.2% in the first 10 months of 2019 from a year earlier, slowing from January-September's 5.4%.

China's consumer price index rose 4.5% YoY in November, faster than October's 3.8% rise. Hog prices more than doubled from a year ago and exceeded a previous record for YoY pork inflation set a month earlier. An outbreak of African swine fever has wiped out about half of the hog population in China, which relies on pork for most of its protein needs.

Beijing made assurances that it was staying on top of the economy, saying China would keep fiscal policy proactive, monetary policy flexible, and land and property prices stable. An economic blueprint, approved by President Xi Jinping and other Chinese leaders at the end of an annual closed-door conclave, promised more fiscal and monetary measures supporting everything from consumption to infrastructure investment and employment.

Japan's economy cooled in the second half of 2019 due to soft global demand and a nation-wide tax hike that led to a slide in consumer spending. Industrial output fell for the second straight month in November. Factory output fell 0.9% from the previous month, a slower decline than a forecasted 1.4% decrease. However, the drop followed a downwardly revised 4.5% decline in October that was the largest month-over-month slump since 2013. Production was hurt by a decrease in output of machinery and information equipment, which offset a rebound in cars and car engines. Manufacturers surveyed by the Ministry of Economy, Trade and Industry expect output to gain 2.8% in December and 2.5% in January.

Other data showed retail sales dropping by a larger-than-expected 2.1% in November, as consumer sentiment remained depressed after October's sales tax hike. The weak readings could pressure the government to come up with new ways to boost growth and force the central bank to maintain its stimulus program.

The government announced a record ¥102.6 trillion ($938 billion) draft budget for fiscal 2020. Outlays for social security in an increasingly aging society and defense spending due to the North Korean nuclear and missile threat were the main drivers of spending. In addition, funding for free preschool education was included as a line item. As part of its efforts to shore up the economy and improve the country's anemic fiscal health, the government plans to cut new bond issuance by around ¥100 billion to ¥32.6 trillion, down for the 10th consecutive year.

Emerging Markets

Political risks seemed to subside in Q4, and emerging markets recovered from their underperformance early in the year. The MSCI EM index gained 11.8% over the quarter, ending 2019 up 18.4%. A number of central banks followed the Fed and ECB in the fourth quarter, with rate cuts in Brazil, India, China, Indonesia, Russia, Turkey and Mexico.

These economies were also buoyed by a relatively weaker dollar, as the demand for safe assets retreated. While sentiment may have improved, hard economic data continues to disappoint, with growth leaders like India (4.5% YoY) and China (6% YoY) posting the weakest quarterly growth in over a decade, according to data released for Q3. EM trade remains weak, with annual combined export growth continuing to decline in the fourth quarter across major exporters such as Taiwan and South Korea. However, with clarity emerging from US-China trade talks, manufacturing outlook improved near the tail-end of Q4, suggesting a revival in exports and cyclical stability over the next few quarters.

Focus On: Removing the Volatility from Risk

In twitter-bot-free 18th-century Russia, Nicolas Bernoulli imagined a simple game where, for a fee, you flip a coin until it lands on tails and get paid winnings based on the number of heads that appear beforehand. In our version, landing tail-side-up pays out nothing, but a heads-up result pays you $1 with subsequent wins double this pot without limit. A table of (some) possible results is provided on the right for illustration.

Heads	Payoff	Probability	E[R]
0	$ 0	50.00%	0
1	$ 1	25.00%	$ 0.25
2	$ 2	12.50%	$ 0.25
3	$ 4	6.25%	$ 0.25
4	$ 8	3.13%	$ 0.25
5	$ 16	1.56%	$ 0.25
...			
20	$524,288	0.00005%	$ 0.25
...			
∞	∞	1 / ∞	$0.25
		Total E[R]:	∞

What is remarkable about this thought-exercise is that each potential outcome yields an expected return of 25 cents and there are infinite potential outcomes. With an infinite total expected return, this game would seem like a great investment at any cost, until you recognize that it is outmatched by an even "more infinite" volatility. (The limit of expected return over volatility converges to 0.) While neither expected return nor volatility make clear an appropriate fee for playing this game, we can safely say it is between zero and infinite dollars.

Fortunately for Nicolas, he only had to ask his math-famous cousin Daniel Bernoulli for a more convincing answer. Daniel would invoke the law of diminishing returns, thus originating utility theory, to solve this apparent paradox. However, this is a made-up game, so any given utility function can be met with a corresponding payoff formula such that the expected return remains at a constant 25 cents. Nevertheless, maybe we can find an even simpler solution.

In reality, there is no way to pay out infinite dollars. If, instead, we limit payoffs to the actual amount of US dollars that exists, depending on your definition of money supply, that puts us somewhere in the range of $10 to $12 on expected return. Of course, even this is too high. In the end, a limit of just 20 wins may be prudent on the basis that the other side is hardly good for more than half a million bucks. This lowers the appropriate fee to just $5 per play.

From this game, we see that expected return has shortcomings. Ignore volatility and you might spend your savings on lottery tickets the next time a huge jackpot builds up. However, shun volatility and you may miss profitable opportunities.

Time, Randomness, and Adaptation

In the real world we have to face a constant barrage of risks. Some are known ahead of time and can be actively avoided or at least prepared for. Others are unknown or unforeseeable. You may leave 30 minutes early for your commute if traffic or weather reports are bad, but you are unlikely to leave an hour early in case you have an unexpected breakdown.

Before planning a long car trip, you can go online to check the range of times the trip takes at that time of day and on that day of the week. Knowing not only the expected travel time but also a likely range or standard deviation of travel times helps prevent arriving too late (or too early). The length of the trip, exposure to traffic-prone areas, and any forecast weather hazards, road closures, or other traffic-inducing local events influence how much leeway needs to be built into a road trip. As the trip approaches, some variables become more predictable or can be assessed in real time.

While a long car trip may last several hours, retirement savers must tackle an investment horizon measured in decades. Temporary setbacks and random inconveniences become background noise against the long-term accumulation and growth of a meaningful nest egg. Adapting your savings plans to new information may seem less urgent than checking the traffic report for your commute, but it exists nonetheless. Unfortunately, this is where volatility shows its shortcomings in capturing risk. Historical volatility may be an appropriate starting point for financial planning to account for unknown risks that seem to appear at random, but it is not sufficient to guide your investment decisions intelligently around risk given the wealth of available information, both historical, and forward-looking.

Risk Parity is No Party

There is nothing wrong with using volatility to measure risk when it is done so responsibly in the context of many other quantitative measures and qualitative assessments. However, sometimes asset managers and investors get too carried away with the volatility Kool-Aid, hence risk parity strategies. Every fad investment strategy needs a good story, and risk parity sounds good at face value. If you imagine that some finite number of independent risk factors underlies any portfolio, and these risk factors can be measured prospectively, then wouldn't it make sense to diversify the portfolio across these factors evenly? The answer to this hypothetical is most assuredly yes. But in practice, it is easier said than done.

Risk parity products generally depart from the traditional 60/40 balanced portfolio by adopting a much smaller equity allocation under the assertion that equity and fixed income represent two distinct risks that should be balanced. And how do you balance them? By measuring their historic volatility and setting this to be equal. Unfortunately for risk parity managers, if you follow that logic to its conclusion, then any 401(k) participant with both risk parity and stable value funds in their lineup should allocate roughly 99% to their stable value fund. We can see at least one fault here in the logic – not taking into account expected returns and correlations. That is why portfolios are usually optimized on risk-adjusted return, e.g. Sharpe ratio, and integrate a covariance matrix for portfolio allocations.

Other obvious criticisms could be casually tossed at risk parity products, serving as a useful illustration of the shortcomings of volatility as a perfect proxy for risk. Equity and fixed income are overly-broad categories that capture a wide array of disparate risks, many of which are highly correlated across the two asset classes. If the argument is to find and diversify across orthogonal risk vectors, we need far more fine-grained allocations. In truth, we can never find the whole set of orthogonal risk vectors that affect a portfolio; maybe they do not even exist. Risk parity solutions are optimized to the past on a narrow proxy for risk. While we may not know the future, we know the present; and presently, interest rates are at historical lows. Traditional risk parity strategies are not dissuaded from ramping up bonds to 80% of a portfolio in light of interest-rate-sensitive duration risk in this context. Nor are they dissuaded from using leverage to elevate expected returns of a bond-heavy portfolio, despite the risks attached to leverage.

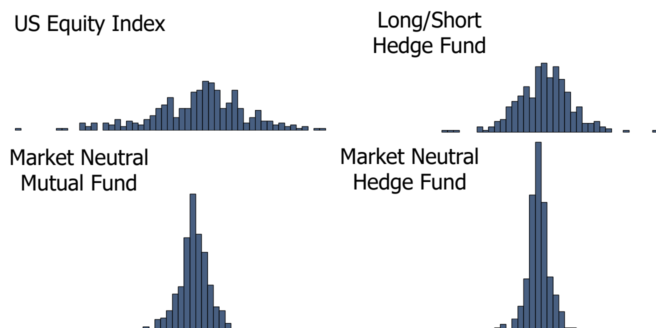
	σ	Risk
Proportional to:	time	+ events
Incorporates:	unknown risk	+ known risks
Adapts to:	historical data	+ forward looking data
Measures:	range of outcomes	+ impact of outcomes

In fairness, not all risk parity strategies are the same. The space has evolved over time and this has limited the reliance on volatility as a stand-in for risk. As our understanding of risk factors has improved over time, risk parity solutions have migrated away from weighting traditional asset classes by volatility and toward weighting underlying risk factors on multiple risk measures. Still, other risk parity strategies model portfolios that will respond well to different potential economic environments and allocate to equalize risk across these states. Many risk parity strategies now attempt to balance risk diversification with the harvesting of risk premia or tactically position the portfolio in response to forward looking data.

How to Reduce Volatility without Really Trying

Risk parity funds aren't the only ones to take advantage of the conflation of volatility as risk in the eyes of investors. Fund managers with the ability to set or influence their fund's NAV may be incented to minimize the volatility of the NAV if a lower volatility will attract or retain more investor capital.

For instance, mutual fund managers that invest in foreign securities will often apply a fair-value-pricing (FVP) adjustment to arrive at a reported NAV. Some firms may choose to use FVP only when a large market movement occurs between the times the foreign markets and US markets have closed. This makes sense in that the market prices reported from the foreign exchanges no longer reflect where the foreign securities likely would be priced if trading were to resume. Without FVP, stale pricing would lead to an exploitable arbitrage opportunity that could be gamed to the detriment of those already or remaining invested in the fund.



While exchange settlement prices are universal, systematic and impartial, FVP is none of those things. Investment managers can set their own FVP for each strategy individually. Some managers choose to apply an FVP adjustment only in the case of very large market movements between closing times. Others may use FVP on a daily basis.

Returns undergo a less subtle smoothing in private equity, hedge funds, and other vehicles where daily liquidity is limited or nonexistent. When an asset manager invests in over-

the-counter or private market securities, they have some discretion on mark-to-market pricing and, naturally, choose to bias the closing prices for their holdings toward the prior day's closing prices. This can reduce the noise that would be introduced by straight bid side, sell side, mid, last, or other methods of systematically setting closing prices. You might think portfolio managers would do their best to close prices at the levels they feel represent where the securities would trade. And, while they may have the knowledge and expertise to do this, they also have a vested interest in producing a P&L that understates the frequency and size of negative returns. Ideally, in any case, investors transact on a less volatile NAV that eliminates what is effectively market noise and more closely approximates the true value of the investment.

The Risks You Know

Low-probability events that pose high-stakes threats are often easier to just ignore. However, you don't have to be an actuary to see the peril in this. In some areas where sinkholes abound, people historically have strapped a long bamboo pole across their backs when travelling by foot. True, it is an inconvenience, but less so than a pair of broken legs. Where it is commonplace to sleep outdoors in heavily wooded areas, people avoid sleeping close enough for a tree to fall on them. In either case, the event probability is low, but the downside and the frequency at which the risk is taken are high.

While it is certainly prudent to approach investment allocation decisions with this same level of risk-consciousness, it can seem like an impossible task. Although a finite number of known risks exist, there are too many to take into account and they are outmatched by countless unknown risks. A common best practice is to establish (or borrow) a set of capital markets assumptions that include expected returns, volatilities, and correlations for all potential asset classes under consideration. Developing a forward-looking covariance matrix is far from intuitive. To make it feasible, volatilities and correlations are often just taken as the most recent x-year average. In contrast, expected returns are generally given robust treatment, with forward looking estimates readily available. This works as a practical starting point, but not as an end point.

Following the creation of sample optimized portfolios, knowledge about how the future may differ from the past can determine appropriate adjustments to the volatilities or correlations used in the model. Beyond this, Monte Carlo simulation and scenario analysis or stress testing informs a more complete understanding of the risk profile of the sample portfolios created from naive mean-variance optimization.

In fixed income, duration and credit quality define the primary axes through which security risks are defined and measured. Volatility can be shrugged off without much, if any, attention. Sans credit events, when you hold a fixed income security to maturity you receive the expected principal and coupon payments in full. A market price may be observed moving up and down, but this is fairly immaterial. That is not to say that market-to-market is not an important aspect of risk management in fixed income. Bond prices (or yields) are embedded with valuable information. The volatility of the bond tells you much less than the price, which implies the probability of default mixed with the expected recovery rate. Volatility is a historical measure by nature; it can never be as current as the most recent price.

Treat the Cause, Not the Symptom

Medicine that reduces your fever does not cure you of the flu. A bandage that stops you from bleeding does not heal a bullet wound. Reducing exposure to investments that, together, have exhibited high volatility can seem like proper risk management, but only when volatility is confused with risk. When you complain to your dentist that flossing makes your gums bleed, they don't tell you not to floss. Investment products or advice focused purely on volatility may increase risk.

As Warren Buffet once wrote, "For the great majority of investors...a diversified equity portfolio, bought over time, will prove far less risky than dollar-based securities. If the investor, instead, fears price volatility, erroneously viewing it as a measure of risk, he may, ironically, end up doing some very risky things." He cites how investing in "safe" Treasury bills or bank certificates of deposit ultimately proves the riskier long-term investment because those "dollar-based securities" have demonstrated high probability of significantly underperforming a diversified equity portfolio.

In an attempt to create a straightforward metric for effectively allocating capital, risk assessment often boils down to the single measure of volatility. Yet, when flattening 3-dimensional risks into a single vector, what gets lost? What gets discarded? Volatility cannot capture the realities of permanent capital loss, illiquidity, defaults, or the failure to meet specific objectives. For real risk analysis, investors must look past the shortcut answer and use volatility as a tool, not as a crutch.

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