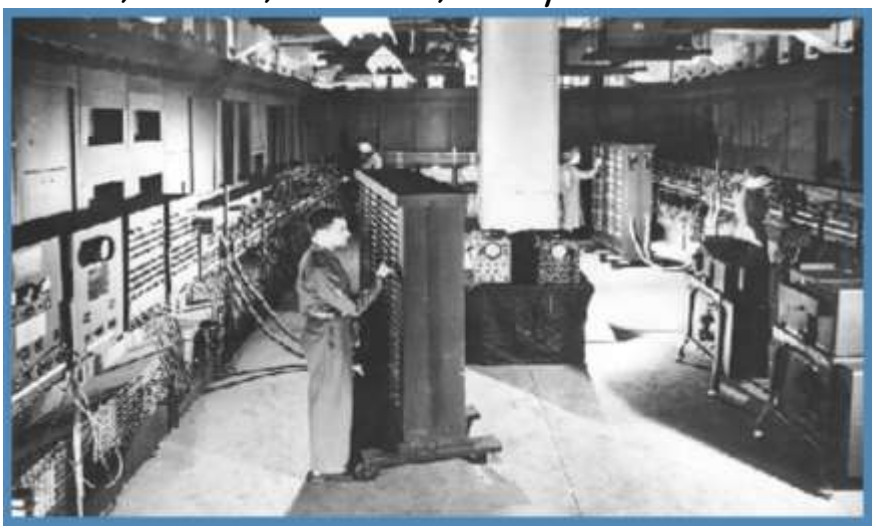
Real life requires active management. June 30,2019

E.Q Trendwatch™

Smaller, faster, smarter, cheaper



"It was not so very long ago that people thought semiconductors were part-time orchestra leaders and microchips were very, very small snack foods." –Geraldine Ferraro (1935-2011)

Venable Park Investment Counsel Inc.

33 Clapperton St.
Barrie ON L4M 3E6

Tel: (705) 792-3991
Toll Free: 866-792- 3991
Fax: (705) 792-3992

Cory Venable

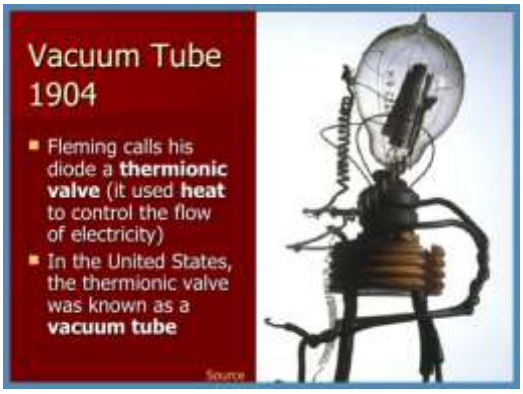
CIM, FCSI, CMT
Market Analyst

Danielle Park

LL.B., CFP, CFA
Portfolio Manager

Venable Park Investment Counsel Inc.
www.venablepark.com

In 2013, *The Atlantic* surveyed scientists, historians, and technologists for 50 innovations since the wheel that have done the most to shape modern human life. The printing press (invented in the 1430's) topped the list, followed by electricity (late 1800's), penicillin (1928) and semiconductor electronics (mid 20th century). While the first three are widely recognized, semiconductors are generally a less understood pillar of human advancement and our economy.



Magical current transmitters

In 1904, British electrical engineer John Ambrose Fleming noticed that the electrical current in Edison's incandescent bulb flowed from a metal filament to an electrode, only when the latter had a positive voltage. This insight gave birth to the thermionic valve or 'vacuum tube' (shown on right) filled with a pure elemental gas at low pressure such as argon or helium. Unlike a mechanical switch that required physical intervention to turn on and off, electrons moved through a vacuum tube automatically and thousands of times faster. The Navy quickly adopted Flemings 'diode' made of vacuum tubes to drive signals for ship-to-ship communications and radar detection. While

effective, they needed significant power, space to keep from over-heating, a steady flow of replacement vacuum tubes, and were too bulky to fit in smaller applications.

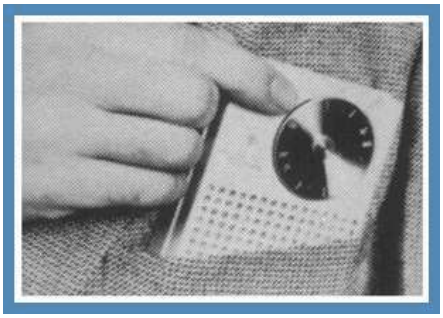
In 1945, American physicist John Mauchly envisioned a desk machine filled with vacuum tubes that could do large scale calculations. With funding from the US military, a team at the University of Pennsylvania led by Mauchly and electrical engineer J. Presper Eckert, designed and built the first electronic general-purpose computer. The Electronic Numerical Integrator and Computer (ENIAC—shown in our opening picture) computed 5,000 addition problems per second and was initially used by the military to calculate how artillery projectiles were affected by different amounts of propellant, barrel angle and elevation.

The ENIAC was enormous, requiring 1,700 sq. ft of space, a concrete floor able to hold 30 tons, enough electrical supply to power 17,800 vacuum tubes, and two large air-conditioners to counter the waste heat it generated.

Miniaturization

Two years later in 1947, the solid-state transistor (shown on right) was devised by William Shockley of Bell Labs. In solid-state transistors electricity flows through 'semiconductor' crystals like silicon, gallium arsenide and germanium rather than through gas-filled vacuum tubes. They are called semiconductors because manufacturers can customize them to conduct electricity under some circumstances but not others. They 'switch' faster and use less energy than vacuum tubes, but their biggest advantage is their miniature scale.

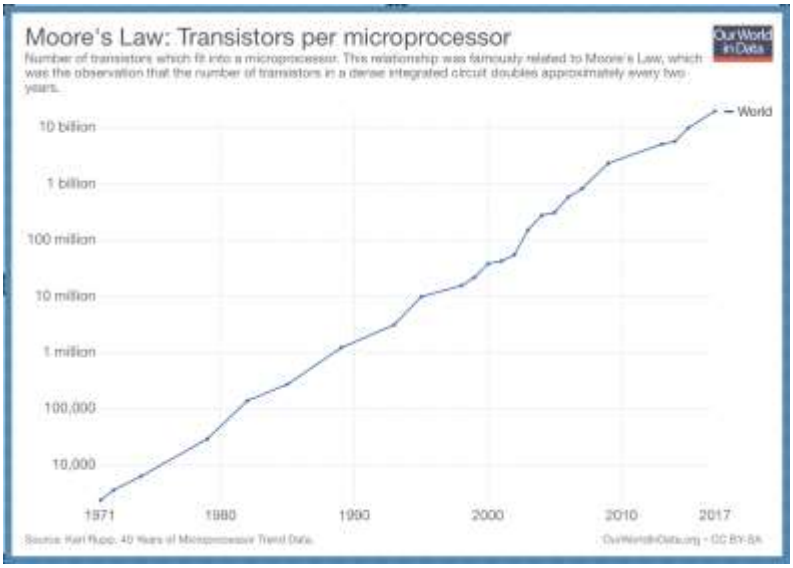
Early portable radios (lower left) using vacuum tubes were about the size and weight of a full lunchbox. In 1948, Texas Instruments unveiled a proto-type transistor radio using semi-conductors (lower right) that weighed half-a-pound and could fit in a suit pocket. The race for tiny accelerated.



In 1965, American engineer Gordon Moore (who co-founded chipmaker Intel in 1968) was director of research and development at Fairchild Semiconductor and observed that the number of transistors that could fit into a 'microprocessor' had doubled approximately every year. He went on to prophesize that micro-chip processing speeds would continue to double, and their costs drop by half approximately every two years. "Moore's Law", as it became known, has proven remarkably consistent in predicting the evolution of semiconductors since (chart next page).

Leaps in processing leave a steady stream of antiquated products and producers, as devices are rendered redundant by smaller, faster, smarter, cost-saving models. MP3 players, cell phones, handheld games, digital cameras and readers, walkie-talkies and portable navigation hardware are just a few technologies displaced by

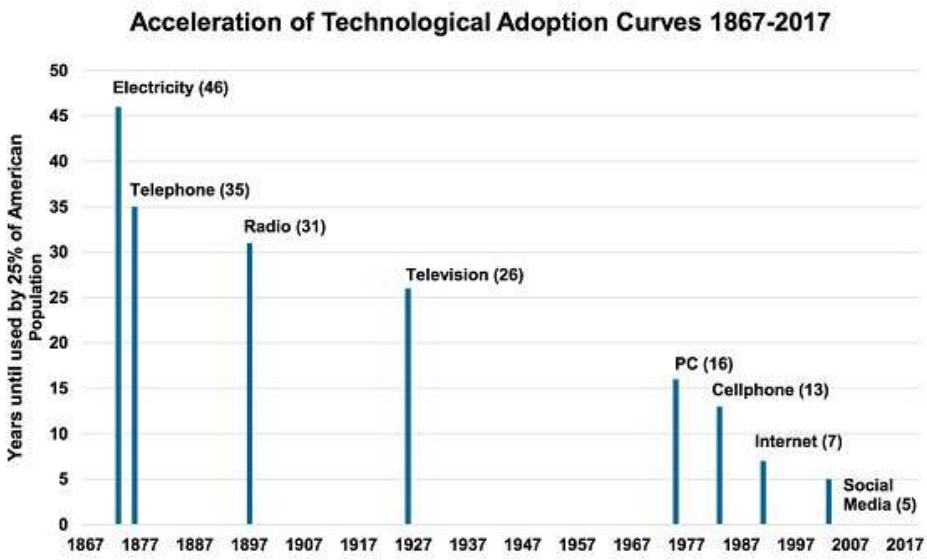
'smart' phones. Despite embracing chip technologies, the speed at which many functions were miniaturized and consolidated into free "apps" on one hand-held took most business leaders by surprise.



The June 2009 release of Apple's iPhone 3G for example (beside), rendered 22 other consumer devices obsolete in one fell swoop. It's difficult to grasp the amount of miniaturization that's transpired in just the last decade. In 2015, *New Atlas magazine* summarized it this way:

> *"If we still relied on tubes, for example, you'd still have your smartphone, but it would be the size of an aircraft assembly hangar, soak up as much power as a small town, and need an army of technicians working 24/7 to keep it going."*

The adoption rate of major new technologies has quickened with each wave (as shown below since 1867). It took 46 years for 25% of the US population to use electricity in their homes, 35 years for the telephone, 16 years for the personal computer, 13 years for cellphones, 7 years for the internet and just 5 years for social media. Now, with some 94% of the 5.3 billion adult people on earth (age 15+) having a cell phone, and 75% of them with smart-phones that access the internet, saturation for this technology has largely been reached and in record time. (See: *Is the tech bubble bursting?*)



It shouldn't be surprising then that global sales of smartphones stagnated in 2018 and turned negative in the first quarter of 2019. Sales of Apple's lead product, the iPhone, were down 17.6% year over year. At the same time, sector profits are under threat from rising backlash around its use of customer information and the prospect of anti-trust prosecutions of conglomerates. (see the book: *Move Fast and Break Things*, for more.)

Starting in the late 1990's, the first wave of device development was about connecting computers and cell phones (chart left). In the last decade, much activity has focused on connecting web-based services with mobile phones and monetizing the data collected through social media and other search sites.

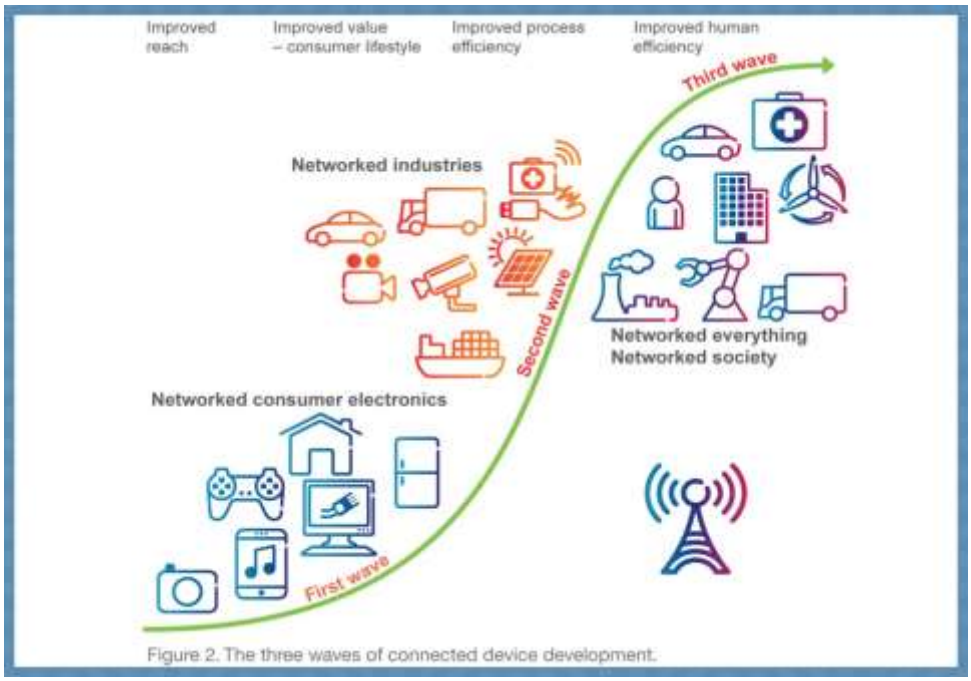
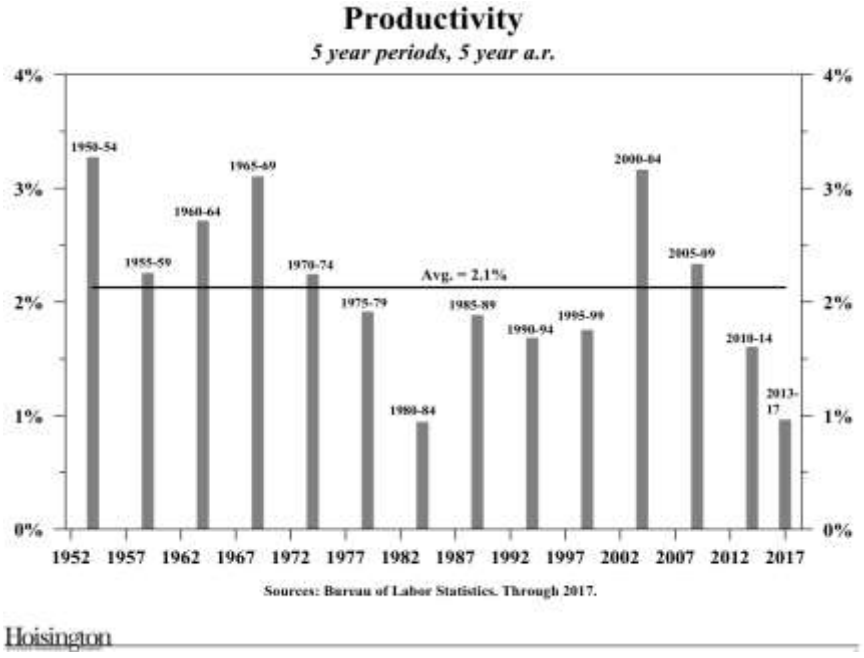


Figure 2. The three waves of connected device development.

When the masses moved on to the internet with personal computers from 2000-2004, overall workforce productivity gains averaged a whopping 3.5% a year. (chart below). Since then, however, productivity improvements have gained just 1% a year (2013-2017) as compulsive phone checking and media distractions increasingly diverted users from fruitful tasks like safe driving, deep-thinking and longer-term focus.

The second wave of device development is about connecting industries like transportation (more efficient movement of passengers and goods), energy (more efficient metering, use and grids) and health care (more efficient resource and information sharing among service providers).

The third wave, just started, dubbed the 'internet of things' (IoT), is about enabling machines to communicate directly with machines. The extent to which human productivity and life-quality are enhanced by these developments will depend to some degree on how individuals opt to spend freed-up time and resources.

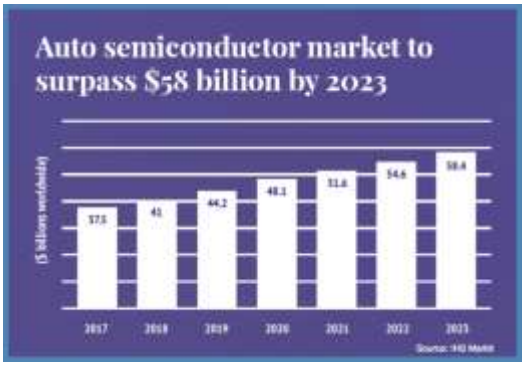


The data-sharing network needed for this third wave requires the latest 5G wireless network—which operates up to 40 times faster than the status quo 4G standard. With near simultaneous data transmission, 5G wireless is competitive with the fastest fiber-optic wired networks as well as conventional cable and telephone services. It's also needed for autonomous vehicles, where instant processing is necessary to avoid crashes. 5G

can transmit video near instantly over long distances, allowing one vehicle to share live images with many others. This also requires extensive investment to outfit coverage areas with thousands of small antennas on cell towers, utility poles, lampposts, buildings and other public and private structures. (For more on this see *Why we need 5G cellular service.)*

Moore's Law slowing?

While advancement in processing speeds and cost-savings continue, the pace has been slowing of late on increased complexity in making atomic level devices in billionths of a meter scale *(yes, you read that right*!) New advanced memory chips 'NAND' used in cellphones and other devices measure less than 20 nanometers (a human hair is about 75,000 nanometers in diameter).



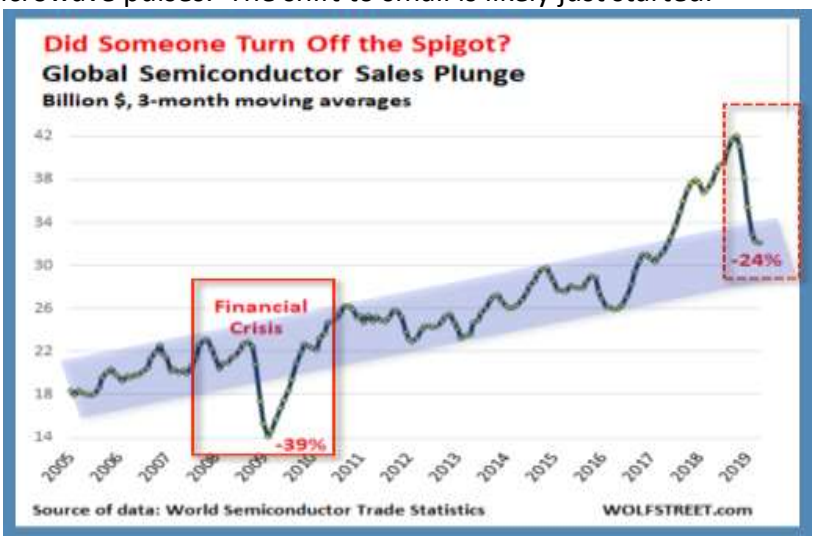
Moore's Law or not, the internet of things with its autonomous machine-to-machine (M2M) and vehicle-to-vehicle (V2V) communications, requires massive data processing. The semiconductors used in automobiles alone are expected to rise 31% over the next 4 years (IHS Markit chart on left). While internal combustion autos use an estimated $400 of semiconductors per vehicle, electric vehicles (EV) use about $2,000 worth, and autonomous vehicles some $15,000 worth of semiconductors each. (source: Semico Research).

On the computer processing side, new desk tops like the Raspberry Pi 4 unveiled this month (pictured right) are the size of credit cards, and retail for $35.

Next, compound semiconductors—that use two or more elements from the periodic table—are expected to be

100x faster than silicon-only microchips (source: Stephen Doran, CEO Compound Semiconductor Applications Catapult). On the scale side, Intel has developed a chip (pictured on the pencil eraser left) that's capable of controlling the spin of a single electron or "qubit" with microwave pulses. The shift to small is likely just started.

With the global explosion of consumer and commercial technology, semiconductor sales rose an average of 10% a year from 2005 to 2018 (chart right) including the 39% decline in 2008-09. Over the past year, however, sales have plummeted once more with weakness across all geographic areas (source: Semiconductor Industry Association SIA). The three-month moving average sales volume in April was 24% lower than the peak last October, in a sharp reversal seen last at the onset of the 2008 recession (see red boxes).



Some sales weakness is attributable to Chinese tech and telecom firms that stockpiled US-made semiconductors in the second half of 2018 anticipating 2019 tariffs and export controls. Some is from a plunge in cryptocurrency mining devices after crypto-prices crashed 80%+ in 2018. A potentially more pervasive driver of weakness, however, is the global credit contraction and worldwide decline in consumer demand for smartphones and personal computers into the first quarter of 2019, following stagnant sales in 2018.

Like many other large corporations, tech and semiconductor companies used the last five years of business expansion to plow their free cash and borrowed funds into large-scale stock buyback programs. This helped to manufacture higher earnings per share in the near-term and also depleted capital reserves for weathering a global downturn. Most have continued to support their share price with ongoing buybacks even as sales have worsened this year. Shares have lost ground, nonetheless. At the end of June, a basket of the 25 largest (by market-cap) US-listed semiconductor companies was 9% lower than in April. As CNBC noted this month: *"Chip stocks are tanking after 'depressing' Broadcom earnings in a bad sign for market."*

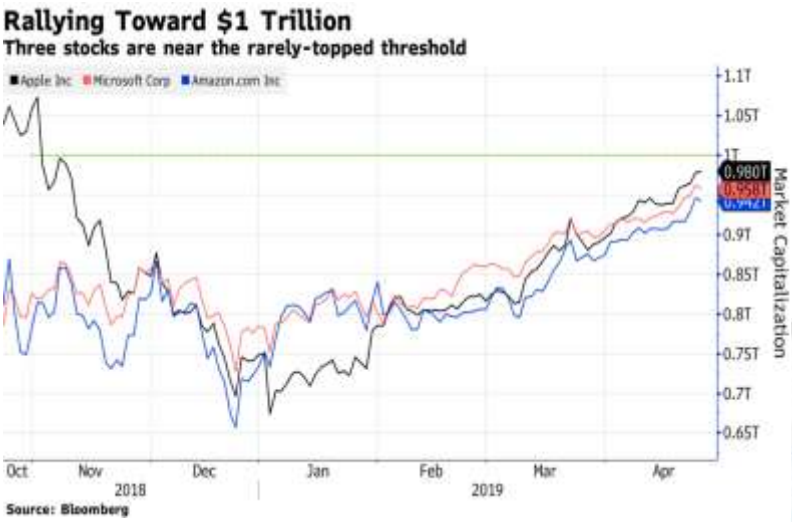
As we explained in Investor's Digest in May 2009, along with the chart shown on left, the world certainly did not stop using semiconductors in 2000, but manic stock prices wildly disconnected from rational investment prospects came to a predictable end:

"…the aftermath of the 2000 tech bubble was not kind to semiconductor investors. After a bubble peak of $105 a share in 2000, the semiconductor index (SMH) deflated more than 80 percent into late 2002. It recovered 130 per cent from 2002-2004 (see box in SMH chart) and then dropped 57 per cent to $15 a share in the bear market of 2008."

As a widely-used industrial metal, copper has long been dubbed the 'PHD' in economics for its close correlation with demand and the economic cycle. At the end of this month, copper prices were down 18% over the past year and 40% since 2011. Some are discounting the relevance of copper as a demand indicator because the metal is now recycled and financialized as collateral for loans in places like China. Semiconductors, on the other hand, are only used in manufactured goods.

Over the last five years, as many companies and sectors have struggled on slower global demand, social media and advances in the tech sector attracted a capital frenzy reminiscent of the late '90s mania. Only three American companies have ever reached a stock market valuation of $1 trillion: Microsoft, Apple and

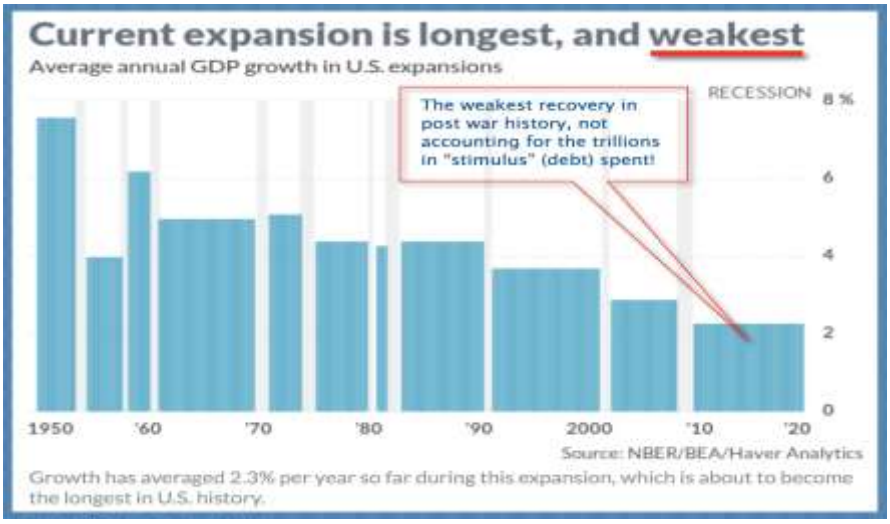
Amazon, and all in the last year. As always, it is critical to never conflate exciting products and services with the presumption that the companies providing them are a good investment at any price.



April, Microsoft shares have held near their highs, while Apple (-13%) and Amazon (-6%) have lost ground since last fall. As in past cycles, the most loved tech stocks are likely to drop more than 50% as capital markets mean revert in completion of this one.

As price enthusiastically exceeds rational investment metrics, indiscriminate capital is destined to suffer the usual consequences. In the first half of 2019, tech revenues and profits missed forecasts by the most since 2009. Since

The economic expansion that began in June 2009 reached 120 months this month, and officially tied with March 1991 to March 2000 as the longest on record. **Averaging an annual GDP growth rate of 2.3%, however, it's also the weakest expansion cycle ever (chart below).**



As economic data disappointed further in the second quarter, central banks in Australia, Russia and India returned to interest-rate cutting, and the influential US and European central banks signalled their easing efforts could resume shortly. It's possible that many months hence, backward looking data will confirm leading indicators and proclaim that a global recession had already begun in the first half of 2019.

World population growth is, thankfully, slowing; still, as we move from 7.7 to 10 billion people, solutions will focus on smaller, faster, smarter, and more cost-effective processes. Technology enabled by semiconductors will continue to play a critical role. We look forward to investing in the sector after dramatically over-valued shares are returned to investment-worthy in the coming bear market.

The U$ weakened against the C$ in June on bets the US Fed may cut rates as early as July. As shown below since 2000, during periods of economic disappointment greenback weakness is typically short-lived with the U$ strengthening against the CAD and emerging market currencies. The loonie bottomed with equity markets in 2002 and 2009, we expect a similar pattern is likely to transpire in the months ahead, generating further capital gains in our accounts.

Oil (WTIC), here since 2000, bounced modestly in June on conflict with Iran and a weaker U$. Still, the downward price trend remains intact. Crude bottomed with the economy/market cycle in 2002 and 2009 and could potentially test the $25 area this cycle, with West Canadian Select (WCS) back in the low teens.

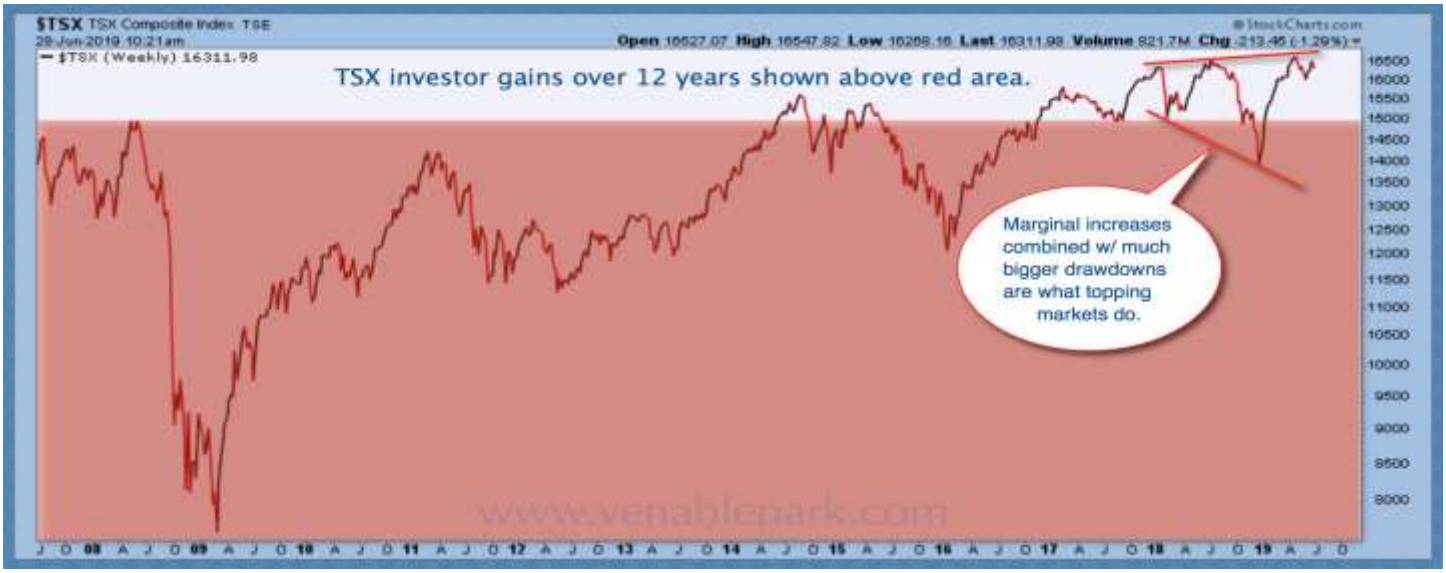
Energy company shares did not go along with the bump in oil prices this month and have slumped back near the lows of late 2018. This reflects the reality that oil supplies are swamping demand as the economy slows.

The largest companies in the S&P 500 (blue) and tech-heavy NASDAQ 100 (green) have continued to buy back their shares year to date and this helped them to recover 2018 losses. The more economically sensitive smaller cap companies in the Russell 2000 (red), however, don't have the same resources to plow into their shares, and they have continued to struggle. The fact that smaller US companies have not benefited more from the buy-America response to trade tariffs, confirms falling revenues and spreading weakness.

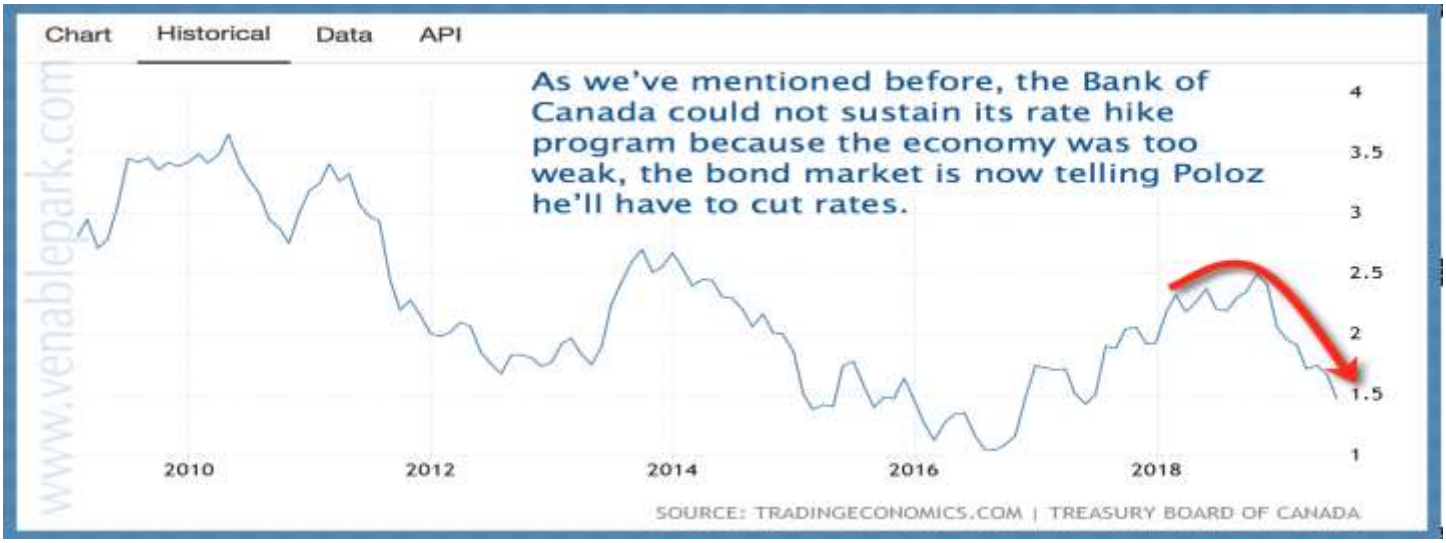
Share buybacks and aggressive rate cuts from the US Fed starting in September 2007 were not enough to save the S&P 500 (2005-2009 below) from a 50% drop and they are likely to be even less effective this cycle.

The lowest quality corporate 'junk' bonds have lost ground to the highest-grade issues in the first 6 months of 2019 (ratio below since 2009). This confirms that capital is becoming more risk-averse and moving to relatively safer bets.

Despite record share buybacks by Canada's largest corporations (see chart last page) the TSX lost ground again in June. **Shown below since 2007, Canadian stocks have been range-bound now since 2014 and are less than 5% above their cycle peak in June 2008, eleven years ago.** The coming recession and 3rd bear market since 2000 are likely to take Canadian stocks back to levels seen in the late 1990's. <u>This would be a secular buying opportunity for value-focused cash at the ready, with dividend yields 3 and 4x higher than present</u>. At that point, Canadian stocks will be risk worth owning again, versus the last decade of return-free risk.

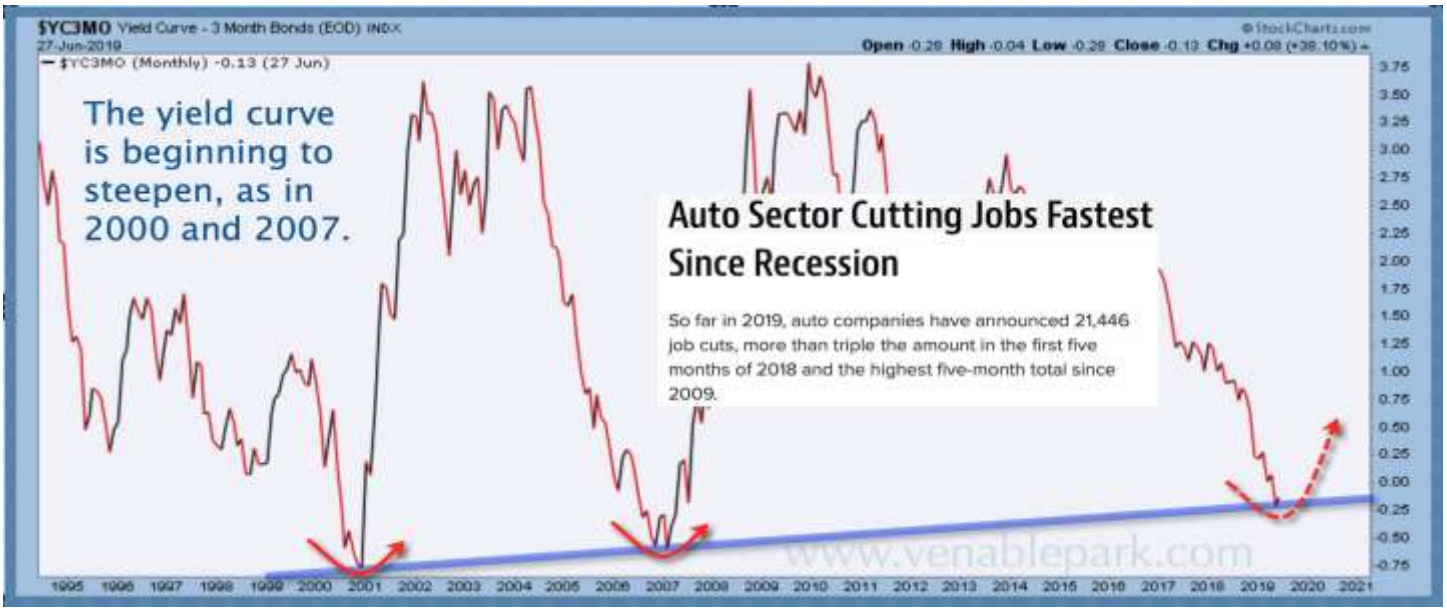


Canada's 10-Year Treasury yield, here since 2009, fell to 1.47 in June, as our government bond holdings rose in value. Though the Bank of Canada (BOC) was hoping to raise rates further before the next recession arrived, that is now unlikely. The BOC will be forced to follow the US Fed in cutting rates in the months ahead as financial stress spreads. Starting from just 1.75%, rather than north of 5% as in past cycles, and with household and corporate debt levels at record highs today, the BOC has very little stimulus to offer this time.



As shown below, Canadian treasury yields are now less than the Bank Canada rate at every point from 1 month to 30 years, while all bonds terms out to 20 years are yielding less than 1 year and under. This means the bond-market believes the BOC's 1.2% growth forecast for 2019 is overly optimistic and recession risks have reached the highest levels since 2007.

US Treasury yield curve (here since 1995) re-steepened in June on bets that the Fed will cut rates again in the last half of 2019. Starting from just 2.5% today, the trip back near the zero-bound will be quick and less simulative than in past cycles. Re-steepening of the yield curve typically marks the onset of recession and confirms other trends like layoffs which are now rising at the fast pace since 2009.



Shares of the four largest US transport companies (UPS, Fedex, J.B Hunt and XPO logistics) shown here since 2009, have been falling since 2018 in reflection of weakening tdemand for shipped goods.

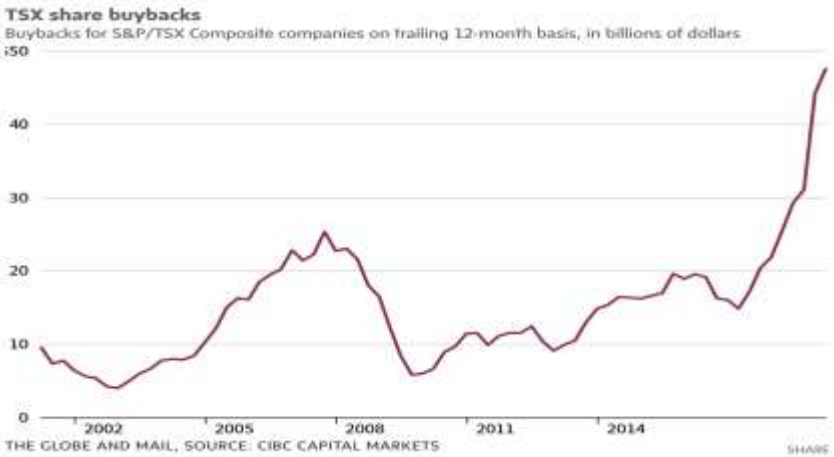
Happy July! ***Quotes of the month:***

"The first computers were designed on paper and assembled by hand. Today, they are designed on computer workstations with computers themselves working out many details of the next generation design and are then produced in fully automated factories with only limited human intervention."

—Ray Kurzweil —*The Singularity is Near (2006)*

"How expensive are equities? Price/tangible book at 10.8x is nearly double the historical norm, a record high that is 24% above the dotcom bubble peak and represents a 3 SD event. In a word – froth."

--David Rosenberg, June 21, 2019



"Corporate buybacks of TSX-listed companies reached an all-time high of nearly $50 billion in the 12 months ending March 31, 2019, and nearly 50% higher than the previous mania peak in 2007 (chart below)."

--Buybacks soar on TSX, but there's A downside, June 2019

Don't forget to visit our blog www.jugglingdynamite.com for daily charts and commentary.