RESEARCH REPORT

November 12, 2018

Stock Rating	BUY
Base Case IRR	10.4%

Bear Case	Base Case	Bull Case
6.3%	10.4%	15.5%

Ticker	FB
Market Cap	$416.6B
EV / Revenue	7.2x
EV / EBITDA	13.2x

52 Week Performance

Facebook Inc.

or ?

Facebook has been in the TMT portfolio since 2015 and has generated a cumulative return of 61% to date, based on an average cost of $90.01 after subsequent purchases. With many significant news headlines surrounding Facebook, and a changing regulatory environment, the TMT team decided to review this holding. With an active weighting of only 6% in the U.S. TMT portfolio, the aim of this research report was to reach a decision as to whether to sell out of Facebook completely or increase the portfolio's stake in the name.

After analyzing how the fundamentals of Facebook's business have changed over the last year, the implications of recent data breaches and executive departures, and the current regulatory environment, the team built an unlevered free cash flow based IRR model to compare its estimated return profile to market expectations of Facebook's business risk. After accounting for the potential upside associated with WhatsApp and Oculus, the TMT team has high conviction in Facebook, which currently trades much cheaper than a year ago. As such, the team will look to increase its active weighting in the name beyond its current 6% level.

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Company Overview

Facebook operates a portfolio of social media platforms that enable users to connect, communicate, and share content. Its platforms include the namesake Facebook, Instagram, and WhatsApp. In addition to its social media business, it operates a Payments business that processes transactions for third-party developers on its social platforms, as well as a virtual/augmented reality hardware business called Oculus.

Revenue from its social media platforms is generated by selling advertisements directly or through third-party agencies to businesses, governments, and other organizations. Ads comprise the substantial majority (~98%) of total revenues. The remainder are comprised of Payments and other fees.

The value proposition Facebook offers its customers is twofold. Facebook is an aggregator of user data. It uses this data to help target specific population segments and demographics for customers' ad campaigns. It also provides advanced analytics to marketers, allowing them to accurately determine campaigns' ROIs. The combination of consumer targeting capabilities and analytics has driven high demand for Facebook's ad inventory.

Broadly speaking, Facebook sells two types of ad products: impression-based and action-based. Facebook generates revenue on impression-based ads when users physically see an ad. Action-based ads require users to take a specifies action, such as clicking through an ad, and generate revenue in the period in which the impressions occur. Both methods provide quantifiable and verifiable feedback to marketing personnel. This model applies to Facebook, Messenger, and Instagram. WhatsApp is not currently being monetized.

Total revenues are influenced by a number of factors. These factors include the number of ads shown, average price per ad (APPA), various user engagement metrics, Payments volumes, and the number of VR devices sold. Facebook discloses changes in the level of ads shown and average price per ad, but does not disclose the nominal figures. Various factors affect how many ads are shown and the APPA. These factors include the effectiveness of ads, the value that marketers place on Facebook's ad inventory, and changes to how Facebook presents the ads to users.

Facebook has recently begun changing News Feed sorting and ad display algorithms to improve the user experience and make interactions with the platform richer and more meaningful. Tangible examples of this include reducing the number of push notifications and down-regulating less meaningful (e.g. click-bait) content. Management has acknowledged that this may hurt user engagement and growth metrics in the short run, but is instrumental in keeping them satisfied in the long-run. Facebook has attained one of the most impenetrable moats in all of business history through immense network effects. The company's value is derived from its user base, and it cannot afford to upset them. Tactics that diminish short-term performance to ensure the long-term viability of the company should be rewarded, not punished, by shareholders.

The News Feed is the most profitable aspect of Facebook's business. Especially on mobile, there are few types of advertising (exceptions would be washroom and movie theatre ads) that command such a large share of mind in consumers. The value of News Feed is evident in management's acknowledgement that APPA increases are driven by increased monetization of News Feed.

Despite its network effects, Facebook is not exempt from competition. Snapchat pioneered the Stories format in social media, and quickly gained a large user base, particularly with younger demographics. To combat the rise of this competitor, Facebook introduced Stories on the traditional Facebook platform and Instagram. Unfortunately, Facebook is running into the same problem as Snapchat: monetizing the format. As Facebook's focus shifts to Stories, it risks impairing its ARPU and APPA. Many analysts and shareholders have expressed discontent with this strategic action. However, it will benefit Facebook's monopolistic position in the long-term.

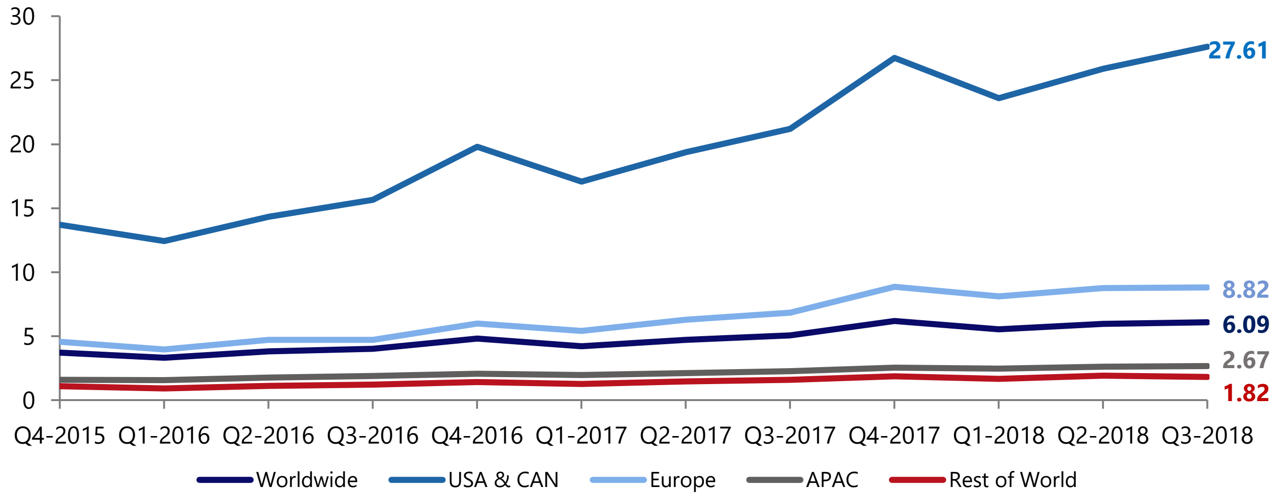
Company Overview (Continued)

Exhibit I shows Facebook's historical ARPU trends in their various geographies. It is interesting to note the enormous discrepancy between the North American segment and the other regions. The chart also shows that although U.S. and Canadian users are the most profitable, they comprise the smallest segment of users worldwide. Facebook has also attained near complete saturation in this region. The reasons for the difference in ARPU between the U.S. and Canada and APAC and the rest of the world is primarily socio-economic. Countries in these segments are significantly poorer and have less developed marketing industries as compared to the U.S. and Canada. As these countries become wealthier, these metrics may improve. This would be a critical growth lever for Facebook, as its core markets are very mature. WhatsApp will also be a key growth lever outside of North America, where most of its user base is located.

The vast differences in ARPU between Europe and the U.S. and Canada are related to differences in the respective sizes of the advertising industries, regulations, and consumer behavior. The regulatory conditions will be discussed later in this report. The reason that the relative size of Europe's advertising industry is smaller than the U.S. is largely cultural. Exhibit II on the next page shows the percentage of GDP attributable to advertising expenditure in several countries. With the exception of the UK, European companies spend far less on advertising than the U.S.. This can partly be explained by European attitudes to advertising. The U.S. and Canada place a high degree of emphasis on direct, "call-to-action" ads, whereas Europeans respond best to subtler ads. This impacts both the quantity of ads, and their quantifiable value to marketers. Without direct actions, it can be difficult to justify expensive ads. Direct, action-based ads are a major contributor to Facebook's ARPU. The U.S. & Canada user base is also the most engaged, with the highest ratio of daily to monthly users. Therefore, the lower European ARPU makes sense when considering differences in cultural and local economic factors.

EXHIBIT I

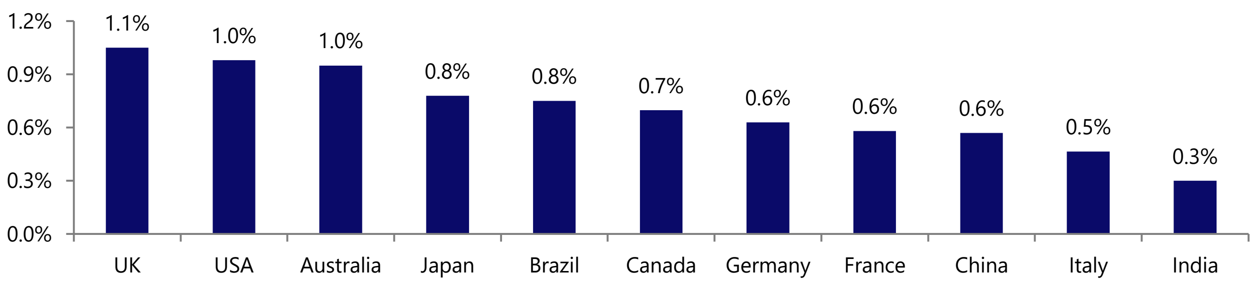
Facebook Geographically Segmented Quarterly ARPU ($)



Source(s): Company reports

EXHIBIT II

Advertising Expenditure as % of GDP, 2016



Source: WARC

Company Overview (Continued)

Another possible contributor to lower European ARPU is competition, with Facebook operating as a near monopoly in North American social media. With Alphabet recently shuttering its Google+ network, the only other major social media players are Twitter and Snapchat. However, Twitter and Facebook serve distinctly different markets; and Facebook is rapidly eroding Snapchat's significance as a competitor. In Europe, however, Facebook has a major competitor. The Russian network, VKontakte (commonly known as VK), has over 500 million accounts. Because VK is targeted at Russian speakers, it is enormously popular in Russia, Belarus, Kazakhstan, Estonia, Kyrgyzstan, Moldova, and Latvia. This competitive pressure may suppress Facebook's pricing power in Eastern Europe, where click-through-rates (CTR) on ads tend to be higher than the rest of Europe. The other networks Facebook competes with worldwide are pictured in Exhibit III on the next page.

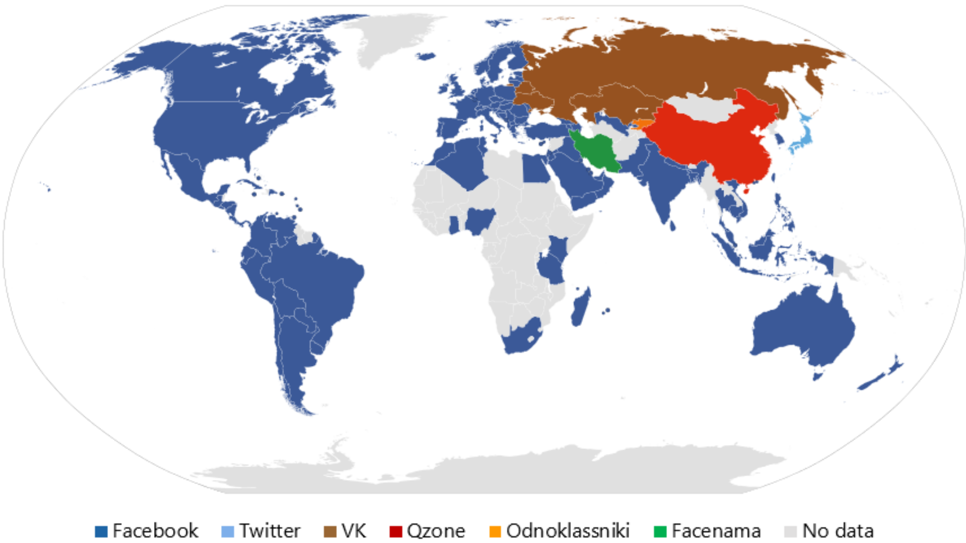
To understand Facebook, one must understand the composition, location, and evolution of its users. The metrics Facebook uses to track engagement are daily active users (DAUs), monthly active users (MAUs), and the ratio of DAUs to MAUs. True DAU and MAU metrics are obscured by duplicate and false accounts. Duplicate accounts can be legitimate (e.g. a business or personal interest page), or illegitimate. Facebook estimates that 3-4% of MAUs were associated with false accounts. The ratio of DAUs to MAUs measures user engagement and represents the frequency of users' interactions with the platform.

A large majority of Facebook's DAUs and MAUs were located in the APAC and Rest of World segments (69% and 72%, respectively). The U.S. & Canada segment is the smallest region by DAUs/MAUs, although it is the most profitable and most engaged.

Growth of the user base is a major factor in Facebook's revenue growth, and hence valuation. Facebook has experienced recent slowdowns in the growth of U.S. and Canadian users, but contrary to what the market appears to believe, this slowdown is not the result of numerous security scandals, but is a function of high saturation in this market. If we compare the most recent MAU figure to the combined population of the U.S. and Canada (subtracting an allowance for those under the age of 15), Facebook's penetration rate is 82%. At this level, growth is likely to be low, and may be negative from time-to-time. This is simply a sign of maturity. The Payments revenue has been, and is expected to continue, declining as users access Facebook on mobile instead of PC. Revenue generated from Oculus is not meaningful to the company.

EXHIBIT III

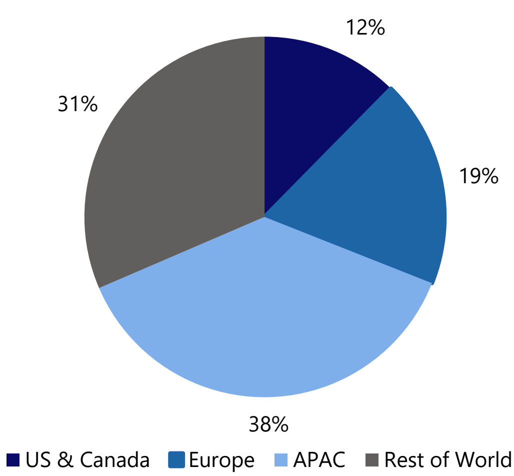
Most Popular Social Media Platforms by Geography

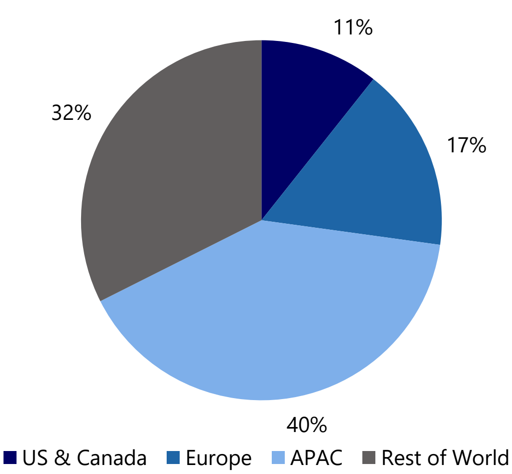


Source(s): Amazon

EXHIBIT IV

DAU (Left) / MAU (Right) Breakdown





Source(s): Company Filings

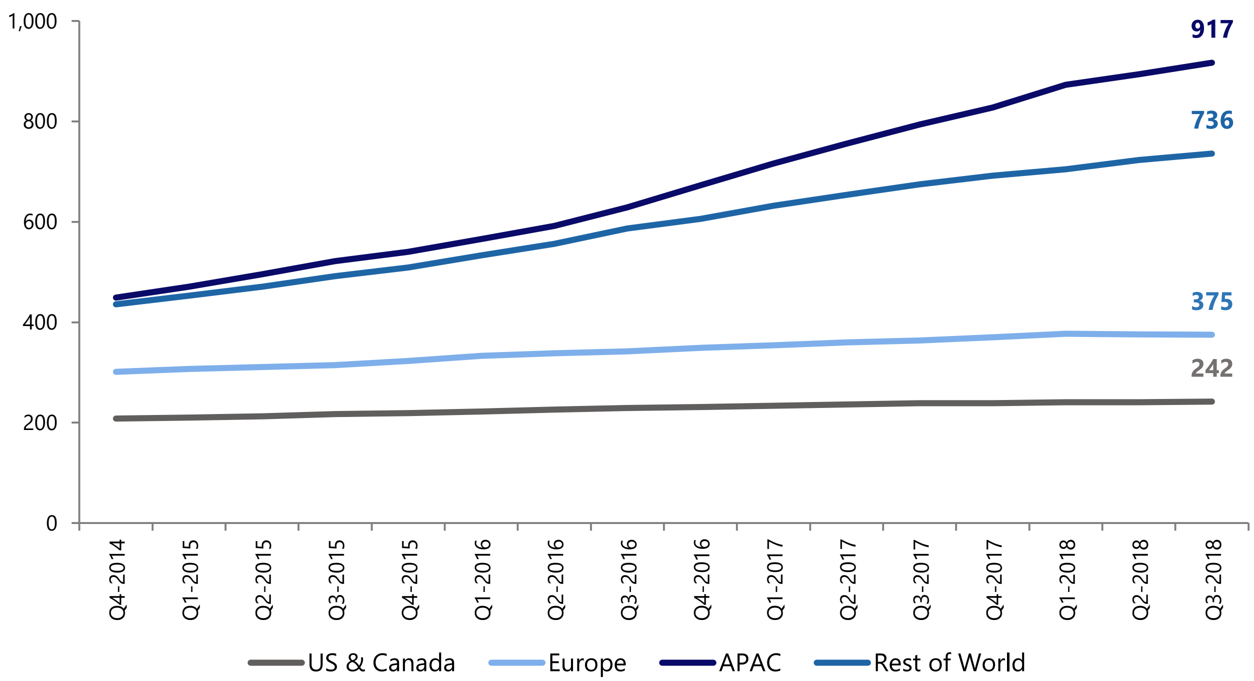
Company Overview (Continued)

While Facebook may have dimmer growth prospects in the U.S. and Canada, they have great opportunity in the rest of the world. Rapid user growth resulting from high population growth and increased penetration, and expanding ARPU are the primary growth levers outside of North America. European growth may not be promising, given the threat of regulation.

If Facebook can realize these growth catalysts, they will be more than able to compensate for any slowdowns or declines in North America or Europe. Such a bearish scenario is highly unlikely, given Facebook's huge network effects. Users are unlikely to leave because of how entrenched modern communication is with Facebook's services, and advertisers are unlikely to leave due to the volume and quality of Facebook's data. Facebook has trapped its users and consumers within its ecosystem, and that is unlikely to change in the foreseeable future.

EXHIBIT V

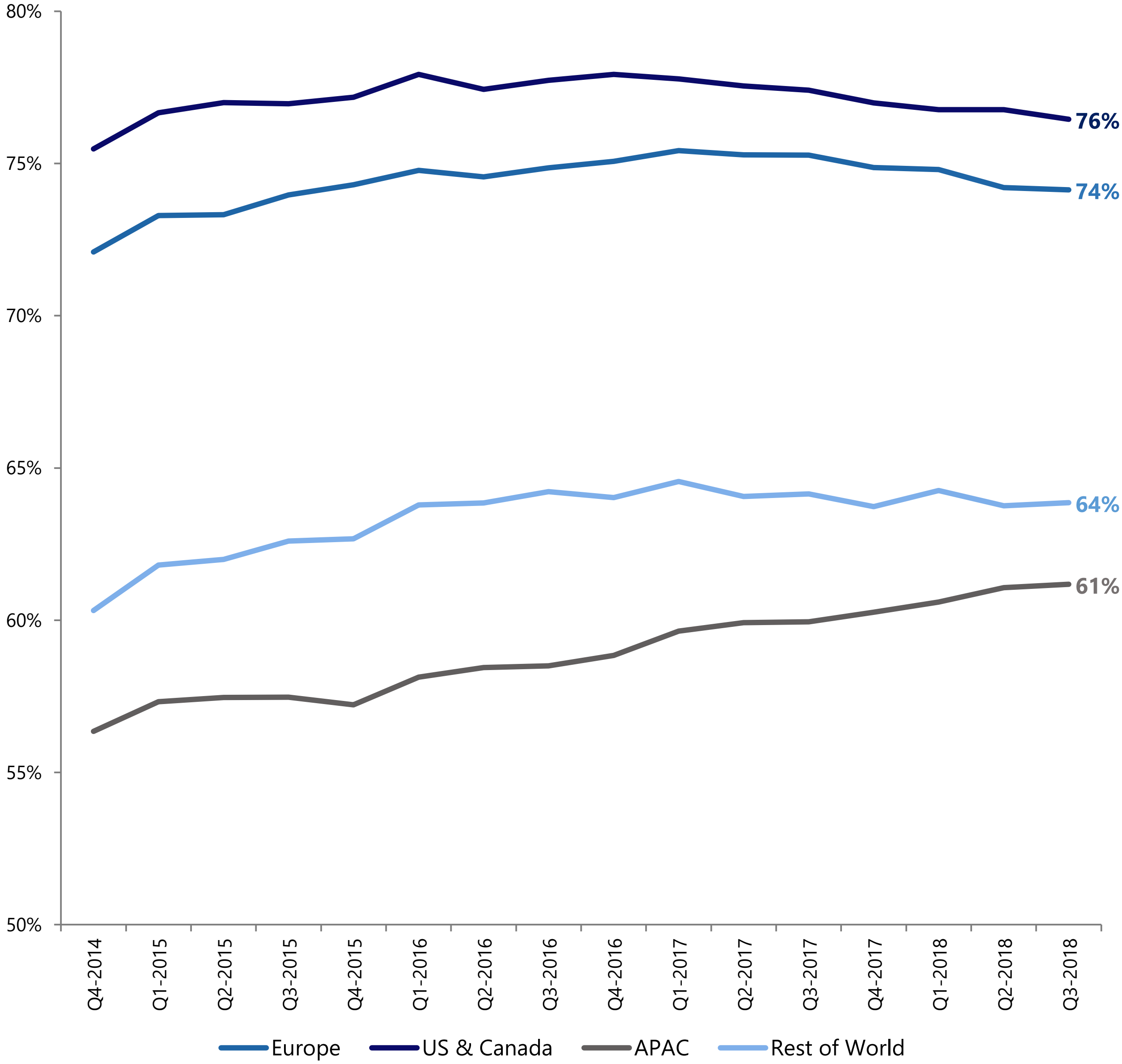
Facebook MAU Trends by Geography (MM)



Source(s): Company Filings

EXHIBIT VI

Historical Quarterly Engagement (DAU/MAU) Rates



Source(s): Company Filings

Recent Developments

March 17, 2018: Cambridge Analytica

On March 17th, Facebook reported that 50 million profiles, later revised to 87 million, had been harvested for Cambridge Analytica in a major data scandal. Three days later, the Federal Trade Commission (FTC) launched an open investigation into whether the company had violated a settlement reached with the U.S. government over user privacy protections in 2011. On April 10th, Mark Zuckerberg testified before the senate and was questioned on the social network's role in the 2016 elections and how it handles data.

This issue dates back to 2010 when the company launched a platform called Open Graph for third party applications. This update allowed external developers to request access to Facebook users' and their friends' personal data. Then, in 2013, Cambridge Analytica developed an app called "thisisyourdigitallife", which involved nearly 300,000 users taking a psychological test that resulted in the company's access to millions of Facebook profiles.

In 2014, Facebook adapted its rules to limit developers' access to users' friends' data without gaining permission. However, Cambridge Analytica did not delete the data they had improperly acquired. In 2015, an exposé of Cambridge Analytica suggested the company was using said data to help Ted Cruz's presidential campaign. In response, Facebook pressured the company to remove all the data they had, which was supposedly done. During the 2016 election, Trump was said to have leveraged Cambridge Analytica's data to create targeted Facebook ads. These issues finally came to light in 2018.

Following the scandal, Facebook shares fell more than 24%, eliminating roughly $134 billion in market value. Investors' bearish outlook mainly surrounded regulatory penalties moving forward.

April 30, 2018: WhatsApp Co-Founder Resigns

On April 30th, WhatsApp co-founder and CEO Jan Koum announced he would be leaving the company amid arguments with Facebook over data privacy and their business model. In the process, Koum forfeited $850 million in compensation.

Both of WhatsApp's co-founders were widely regarded as devout privacy advocates, pledging to preserve the integrity of WhatsApp when it was sold to Facebook in 2014. In 2016, the app became entirely end-to-end encrypted and had resisted calls from government agencies to build back doors even for counterterrorism and law enforcement reasons. That said, Facebook had pushed WhatsApp to change its terms of service last year, giving the social network access to WhatsApp users' phone numbers. Furthermore, tension existed surrounding differing views of the business model, with Facebook wanting to eliminate the annual subscription fee and chase advertising revenue instead.

Investors responded to the news negatively, with many believing Koum's departure represented an overarching misalignment of management.

July 26, 2018: Earnings Call

On July 26th, Facebook's management warned investors that revenue growth was projected to decelerate for the rest of the year. The CFO stated that Facebook would likely see high-single-digit percentage declines for both the third and fourth quarters.

The weak outlook was attributable to investments in new products and bolstered privacy tools that were expected to compress operating margins. The company announced that total expenses were projected to grow 50 – 60% compared to 2017, largely driven by increased security, investments in AR/VR, marketing, and content acquisition costs. Facebook also stated for the first time that the number of American monthly users flatlined. Furthermore, 2019's outlook involved expense growth outpacing revenue growth and operating margins were projected to move towards the mid-30%'s in the coming years.

Facebook shares plunged almost 20%, making it one of the biggest single-day drops in company history. Investors were especially pessimistic given this was the first financial report since the Cambridge Analytica scandal.

Recent Developments

August 1, 2018: CSO Leaves Facebook

Facebook Chief Strategy Officer Alex Stamos announced that he was leaving Facebook to take a position at Stanford University.

It is reported that this departure had been long-awaited as Stamos had been said to have strongly disagreed with Facebook's disclosure and investigation surrounding the alleged efforts by Russian operatives to influence the outcome of the 2016 U.S. presidential election.

Shortly after, shares were up 3 percent, as Stamos's departure signaled to investors that the company would be more unified going forward.

August 29, 2018: Executives to Appear Before Congress

Top executives at Facebook were called to appear before Congress. Lawmakers paid special attention to the possible interference of Russia in the 2016 U.S. election and how Facebook's advertising platform may have facilitated this interference. COO Sheryl Sandberg testified in the first week of September before the Senate Intelligence Committee.

Over the course of this week, shares dropped as much as 9 percent, in part due to the negative publicity surrounding the hearings.

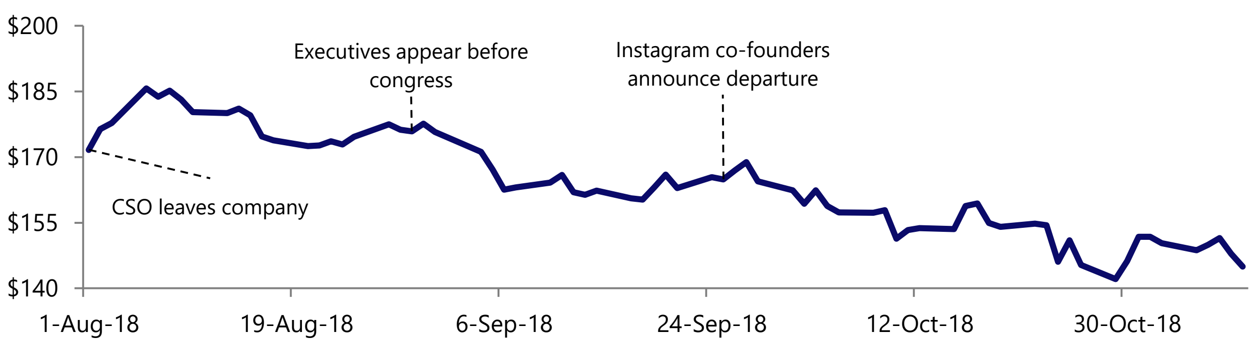
September 25, 2018: Instagram Co-Founders Resign

After growing tensions with Mark Zuckerberg concerning the direction of Instagram, the co-founders of Instagram announced their departure from the company. On October 1st, Facebook announced that it would be naming 10-year veteran employee, and previous head of product for Instagram, Adam Mosseri, as the head of Instagram.

Both Kevin Systrom and Mike Krieger, who had been associated with Facebook since their acquisition of Instagram in 2012, had achieved a level of autonomy with Instagram's brand and product, while capitalizing on Facebook's resources. However Zuckerberg's increased day-to-day involvement with Instagram created frustration for Systrom and Krieger. With Instagram becoming a greater factor in Facebook's future, and the founders no longer present, Instagram is expected to become more intertwined with Facebook going forward.

EXHIBIT VII

Facebook Stock Performance



Source(s): Bloomberg, Financial Post, Wall Street Journal

Recent Developments (Continued)

September 28, 2018: Data Breach

Facebook revealed that it had discovered a security breach that affected nearly 50 million users, which allowed hackers to take over people's accounts. They later reported that they had fixed the security issues that caused breach. This breach led to further concerns that Facebook is collecting too much personal information without establishing proper mandates to look after it. U.S. Senator Mark Warner spoke of the breach as deeply concerning. Shortly after, a Canadian class-action lawsuit was launched against Facebook.

Hackers erroneously accessed data that legitimate third-party applications had collected, giving them the ability to take over user accounts Shares fell 2.6 percent the day of due to increased concerns surrounding security.

October 12, 2018: Personal Data Hacked from 29M Accounts During 50M Breach

Two weeks after the major security breach announced on September 28th, Facebook reported that 29 million accounts had some form of information stolen. This information included emails, phone numbers, names, sites visited, and even places checked into.

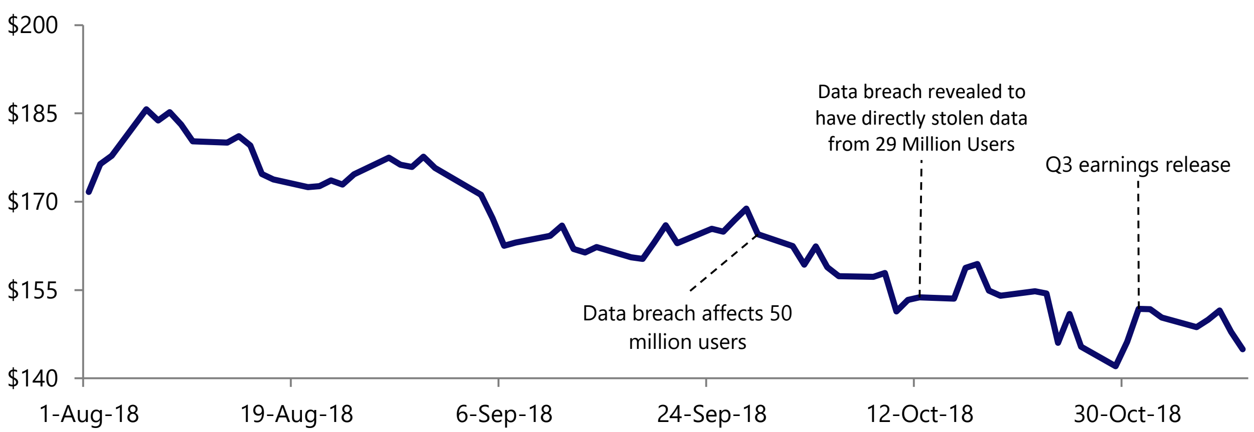
Between the announcement and the original breach, shares dropped as much as 10 percent due to further elevated security concerns.

October 31, 2018: Q3 Earnings

On October 31st,. Facebook released their third-quarter earnings report. 2019 guidance projected a significant uptick in compliance costs, capex, and continued SG&A and R&D spending. Despite the cost guidance, the market's reaction was relatively neutral, as management reassured that these investments were required to maintain Facebook's dominant position in the social media market.

EXHIBIT VIII

Facebook Stock Performance (Continued)



Source(s): Bloomberg, Wall Street Journal, Financial Post

Regulatory Environment

Regulatory Overview

As a digital business that captures large amounts of user data, Facebook is highly sensitive to changes in the regulatory environment. Currently, there are two major regulatory trends that are relevant to the firm. The first major trend is increased regulation and consumer protection surrounding data privacy and the usage of customer data. The second key trend is a push for increased taxation on digital firms by foreign governments. The team has examined these areas in depth to evaluate their impact on Facebook.

Data Privacy Regulation

One of the most significant global regulatory changes of 2018 was the implementation of the General Data Protection Regulation (GDPR). The GDPR is a European Union regulation designed to reshape the way data is handled by firms, replacing the 1995 Data Protection Directive. The GDPR applies to all firms that collect data on individuals from the EU, regardless of where the firm itself is located, as well as to all firms that process data within the EU. While the regulation applies to firms of all sizes across every industry, internet companies that are built around the collection and utilization of personal data are most impacted by it. Violations of GDPR carry strict penalties that can reach up to 4% of the offending firm's global revenues.

The objective of the General Data Protection Regulation is to ensure transparency, lawfulness, and fairness in the use and handling of personal data. In practice, this means that companies must disclose to users how they are using personal data and provide a legitimate reason for each use. Once data is collected for a certain purpose, it cannot be re-used for other purposes. The GDPR also requires companies to collect and store as little personal data as possible to achieve the intended purpose, and to only retain such data for as long as necessary. Furthermore, companies must take steps to ensure the security of data, and to allow for personal data to be erased or rectified if requested.

In response to the GDPR, Facebook has rolled out many of the required changes to users outside of the EU. Around the world, users now have the ability to download their information, restrict Facebook from using data from partners to show ads, and control how certain data, such as religion and political views, are used by the company. At the same time, the company has changed their terms and conditions so that only EU customers are governed by EU privacy laws, instead of all countries outside of Canada and the United States. When probed if users worldwide would receive the protections of GDPR, Zuckerberg could only promise that "directionally…in spirit, (users would receive) the whole thing". This implies that certain aspects of the regulation are detrimental to the business – otherwise, such complication would not be necessary.

EXHIBIT IX

Key Principles of the GDPR

- Lawfulness, fairness and transparency
- Purpose limitation
- Data minimization
- Accuracy
- Storage limitation
- Integrity and confidentiality
- Accountability

Source(s): Information Commissioner's Office

Regulatory Environment (Continued)

The main area that the GDPR will impact Facebook is in its core advertising business. If consumers restrict Facebook's ability to use their information for advertising purposes, their targeted advertisements will be less effective, reducing advertising spending. Instead of passively obtaining consent from users, Facebook will need to make a compelling case to consumers for using their data. The impact on Facebook's advertising revenue will be tied to consumer buy-in on the value of targeted advertisements. Furthermore, Facebook's growth prospects may also be dampened by the GDPR's restriction on collecting data that is not necessary. Data could previously be collected and stored for use in future endeavors, which helped the firm produce innovative products and enhancements. There are some upsides for Facebook, however. One way that the GDPR benefits internet giants is that it creates another barrier to entry for upstarts; without an established reputation, these firms will face difficulty persuading users to explicitly grant them permission to utilize data. This could widen Facebook's economic moat and bring the firm additional security.

Another prominent piece of legislation is the California Consumer Privacy Act (CCPA). The CCPA was passed on June 29, 2018, to give Californians more ownership, control and security with regards to their personal information. The act mandates that businesses disclose the categories and specific pieces of information they collect, why they collect this information, and who they share it with. It also allows Californians to request for their data to be deleted or withheld from being sold. While it is structured relatively similarly to the GDPR, it includes fewer restrictions. The act will come into effect on January 1, 2020.

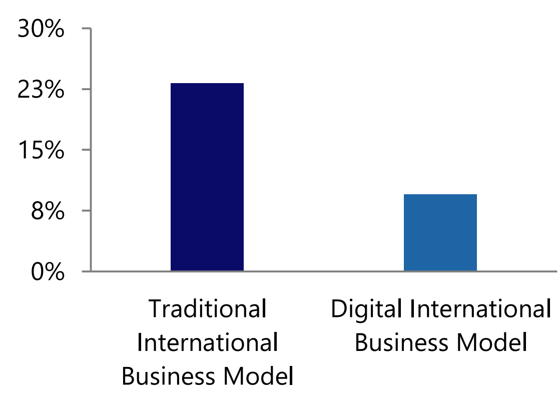
Given that Facebook has introduced many of the GDPR changes to its customer base worldwide, the California Consumer Privacy Act is unlikely to have a material impact on Facebook. This is especially true since many original provisions of the bill that differed from the GDPR, such as the right for Californians to sue companies directly for rule infringement and the misuse of data, have been removed. The CCPA does serve as an indicator that legislative bodies around the world are likely to follow the EU's lead in implementing more encompassing privacy laws.

Digital Taxes

In 2017, the European Commission (EC) spearheaded an effort to tax the digital economy. The EC asserts that digital businesses utilize the infrastructure of regions that they operate in to create value but avoid taxes because they lack a physical presence. In the long run, the commission aims to reform corporate tax rules to better account for digital business activities. This would involve registering and taxing profits where businesses interact with users, rather than where the business is located. In the interim, however, the EC seeks to impose a 3% tax on EU revenue from digital advertisements, digital marketplaces with user-to-user selling, and the sale of user data that would apply to companies with more than €50 million of EU revenue and €750 million of global revenue. Ireland, Sweden, and Denmark have criticized the proposal, meaning that it is unlikely that the bill receives the unanimous approval required to be passed.

EXHIBIT X

The EC claims that digital businesses face a lower effective EU tax rate than traditional businesses



Source(s): European Commission

Regulatory Environment (Continued)

Despite this standstill, individual Member States are moving forward with their own proposals. Spain, for example, released a draft bill similar to the EU proposal that will be in force in 2019 if approved. In the 2018 UK Budget, Chancellor of the Exchequer Philip Hammond announced a Digital Services Tax (DST). This tax is currently in the consultation phase; it will be introduced to parliament following the 2019 UK Budget and come into effect in April 2020 if approved. The DST will be set at 2% of UK revenues and applied to search engines, social media platforms, and online marketplaces (excluding the sale of a firm's own goods). The tax will only be applied to digital businesses with over £500 million in annual revenue and £25 million in UK revenue and can be deducted against UK corporate tax obligations. Other Member States such as Austria are likely to follow through with independent policies if an agreement is not reached.

There is a strong case to be made that the EU DST would constitute de-facto discrimination. First and foremost, the high revenue thresholds capture many U.S. firms, but few EU firms. In fact, the threshold was increased to €50 million from €10 million after an acknowledgement was made in an earlier EC report suggesting the latter would capture EU firms. Secondly, the scope of the tax means that largest digital firms in Europe such as Spotify and Supercell are excluded from the tax. Furthermore, the digital service tax arbitrarily allows for VAT to be subtracted from taxable revenue, which exists in the EU but not in the United States. This means that US firms will have a higher tax base than equivalent EU firms.

If the DST is implemented, it is likely that the U.S. would retaliate with either a WTO case against the EU (or a given Member State), or with retaliatory tariffs against the offending. Treasury Secretary Steve Mnuchin warned the EU against imposing unilateral sanctions, stating that the administration has "strong concern with countries' consideration of a unilateral and unfair gross sales tax that targets our technology and internet companies."

EXHIBIT XI

Many large digital firms in the EU fall outside the scope of the DST

Source(s): European Commission, World Economic Forum

In the short term, it is unlikely that a digital tax will impact Facebook's strength as a holding. If a digital service tax receives the approval necessary to be implemented, it is likely that the United States will act to discourage its application. In the long run, however, it is possible that the tax system will be revitalized to better reflect value creation in the modern economy. Such a shift would likely result in a greater tax burden for Facebook, dampening earnings. The Organisation for Economic Co-operation and Development aims to achieve a consensus-based solution by 2020, however, even if this deadline is achieved, it will likely take time for such a system to be implemented. While the TMT team plans to closely follow developments surrounding an updated global tax framework, such a shift is too distant to incorporate in our current outlook.

Valuation and Portfolio Implications

To value Facebook, the TMT team built an intrinsic IRR model which projected the company's unlevered free-cash-flow (UFCF) until 2029 and applied an exit UFCF multiple. The model's key value drivers were informed using the analysis completed in Company Overview, Recent Developments, and Regulatory Environment.

Average Revenue Per User

Facebook's ARPU is calculated by dividing total revenue by MAU. Respectively, US & Canada, Europe, APAC, and Rest of World have seen ARPU grow at two-year CAGRs of 29.6%, 33.4%, 21.0%, and 24.3%. This resulted in a global ARPU CAGR of 23.6%, which is anticipated to slow down to 20.0% from 2017 to 2018E. APRU for each region was projected using Bull, Base and Bear cases. Global ARPU growth for each segment was projected to slow linearly from 2018E's growth rate to a terminal rate of 5.0%, 2.5%, or 1.0%. The base case, 2.5%, represents a scenario in which Facebook has saturated its current applications in terms of average advertising/user and can only pass on pricing increases at the rate of nominal economic growth. Bull and bear cases respectively represent scenarios in which Facebook can pass on pricing increases at the economic growth rate plus 2.5% and the economic growth rate less 1.5%. A partial breakdown of ARPU growth rates per segment is displayed below. As the long term outlooks for the competitiveness of internet services and the social media market are very unpredictable, the TMT team chose to conservatively assume that electronic advertising will become a commodity in the long-run.

Monthly Active Users

To predict MAU, the team again used Bull, Bear and Base cases to represent Facebook's geographic penetration and geographically-segmented population growth. In Base Case, Facebook maintained its market penetration, so MAU would only grow at the rate of population growth. In the Bull Case, Facebook would gradually increase market penetration and therefore grow MAU at a rate above that of population growth. In the Bear Case, Facebook would lose market share and grow MAU slower than population growth.

EXHIBIT XII

USA & Canada MAU Projection Assumptions

Population Growth	0.8%
Current Penetration	82.0%
Bull-Case Penetration	90.0%
Bear-Case Penetration	75.0%
Implied Bull Population Spread	0.9%
Implied Bear Population Spread	(0.9%)
Bull-Case Growth	**1.7%**
Bear-Case Growth	**(0.1%)**

EXHIBIT XIII

Segmented Annual ARPU Growth Rate, Base Case

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
US & Canada	21.0%	19.2%	17.3%	15.5%	13.6%	11.8%	9.9%	8.1%	6.2%	4.4%	2.5%
Europe	19.0%	17.4%	15.7%	14.1%	12.4%	10.8%	9.1%	7.5%	5.8%	4.2%	2.5%
APAC	15.0%	13.8%	12.5%	11.3%	10.0%	8.8%	7.5%	6.3%	5.0%	3.8%	2.5%
Rest of World	12.5%	11.5%	10.5%	9.5%	8.5%	7.5%	6.5%	5.5%	4.5%	3.5%	2.5%

Under Base Case, Facebook can only increase terminal ARPU at the rate of long-term nominal economic growth

Source(s): Capital IQ

Valuation and Portfolio Implications (Continued)

Revenue

Next, the team projected Facebook's advertising revenue by multiplying segmented ARPU and MAU, resulting in an anticipated 22.6% revenue growth rate in 2019E and compressing to a rate of 4.9% in 2029E under Base Case assumptions.

It is important to note that these figures are inherently conservative as they imply WhatsApp, which is currently not monetized, will continue to dilute ARPU via user growth and will at no point begin to generate revenue. In reality, Facebook's track record of implementing non-obtrusive advertising demonstrates that the company will likely find success in integrating advertisements in the application. Further, zero revenue is anticipated to be generated from Oculus, which is currently a leader in the virtual reality hardware industry. In all, the team's revenue projections purposefully isolate Facebook's non-speculative revenues.

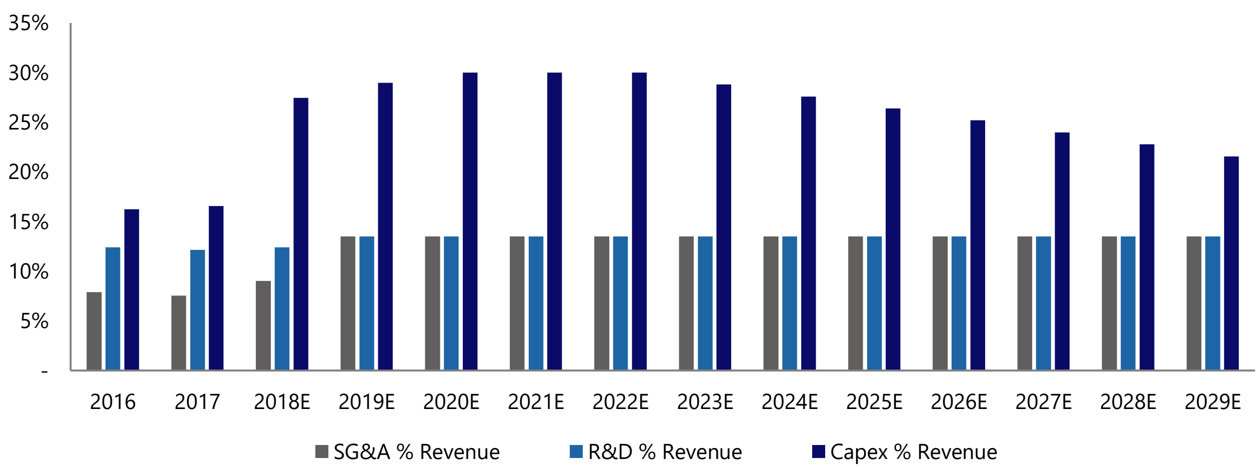
Operating Model Assumptions

Prior to 3Q17, Facebook had a five-year average operating income margin of 41.5% and spent, as a percent of revenue, 7.5% on SG&A, 12.1% on R&D, and 16.6% on capital expenditures. After a series of changes in regulatory requirements, as outlined in Regulatory Environment and Recent Developments, the immediate costs associated with GDPR compliance and expectations of future compliance costs increased. As a result, management guided for capital expenditure to increase to approximately 30% of revenue and for their operating income margin to fall to 35% in the three to five years following 2018. As the costs associated with compliance relate to SG&A and R&D, the team raised these costs to match operating income guidance, which resulted in SG&A and R&D costs both increasing to a long-term average of 13.5% of revenue.

As a significant portion of the capital expenditures associated with compliance are one-time investments, the team trimmed Facebook's CapEx starting in 2022E, falling to 20% of revenue by 2029E.

EXHIBIT XIV

Historical & Projected Operating Model Assumptions



Source(s): Capital IQ

Valuation and Portfolio Implications (Continued)

Model Mechanics and FCF Multiple

After running a traditional discounted cash flow model, the team realized that given the large upfront opex and capex associated with compliance and other investments, the present value of Facebook's net free cash flows was highly sensitive to the estimated cost of capital. As such, the team decided to look at the implied return profile of Facebook's non-speculative businesses and assess, in addition to the potential value of WhatsApp and Oculus, whether the estimated unlevered IRR compensates adequately for the risk profile of Facebook's business. Using a long-term industry average UFCF exit multiple of 23.6x, this analysis yielded a base case IRR of 10.4%, based on Facebook's current enterprise value of $457.7 billion.

EXHIBIT XV

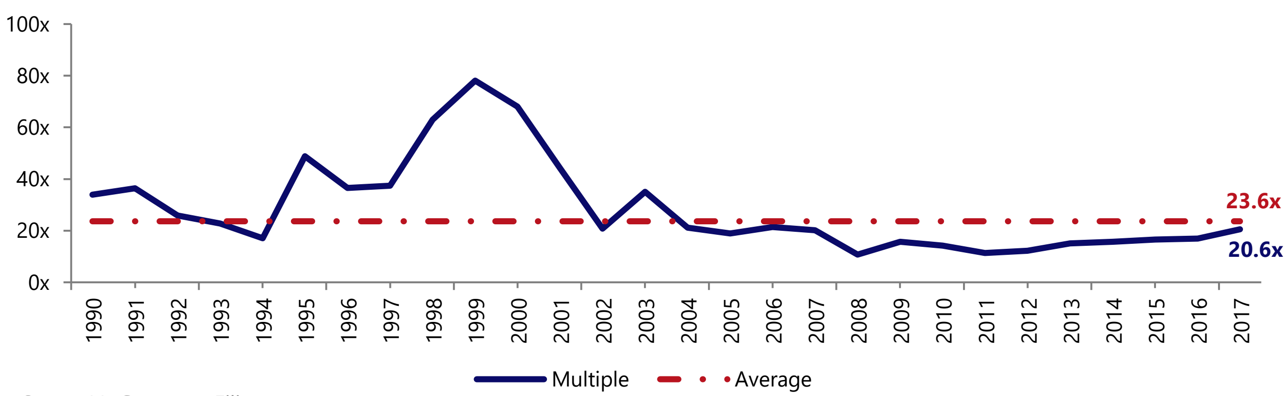
Unlevered FCF IRR Calculation

Fiscal Year	2017	2018	2019	2020	2021 …	2028	2029
EBIT	**20,203**	**24,445**	26,234	30,680	35,607	73,641	76,993
Less: Taxes	(4,660)	(5,353)	(4,197)	(5,522)	(7,121)	(14,728)	(15,399)
NOPAT	**15,543**	**19,092**	**22,037**	**25,157**	**28,486**	**58,913**	**61,594**
Plus: D&A	3,025	3,943	5,994	8,388	11,031	29,740	31,406
Less: Increases in NWC	(1,015)	620	(746)	(905)	(1,080)	(2,394)	(2,510)
Less: Capital Expenditures	(6,733)	(14,250)	(19,000)	(23,866)	(28,490)	(47,927)	(47,593)
Unlevered FCF	10,820	9,405	8,284	8,775	9,947	38,331	42,897
Terminal Value	-	-	-	-	-	-	1,011,959
		Today's EV:					
Implied IRR		*(457,716)*	*8,284*	*8,775*	*9,947*	*38,331*	*1,054,855*
10.4%						*FCF Multiple*	*23.6x*

Source(s): Company Filings

EXHIBIT XVI

S&P 500 IT Sector Index Historical FCF Multiples



Source(s): Company Filings

Valuation and Portfolio Implications (Continued)

The team sensitized the estimated IRR to the UFCF exit multiple and the various Bull, Base, and Bear scenarios for MAU growth and ARPU growth. The team used a range of UFCF exit multiples from 21.6x to 26.6x, with more weight placed on the upper end of this distribution, as the quality of Facebook's business commands a premium multiple over the average North American technology company. For reference, the company currently trades at ~32.7x. The gap between Facebook's UFCF multiple today and the Base case UFCF exit multiple in 2029 is the result of how much growth is being priced into Facebook's stock today, compared to the much lower long-term FCF growth rate that will be experienced in 2029.

Additionally, it was important to consider that, as noted previously, this valuation assumes no free cash flow will be generated from WhatsApp and Oculus. With over 1.5 billion users, it is safe to say that WhatsApp is an extremely valuable business, but until Facebook demonstrates a proven revenue model for the platform, trying to value this segment would be an extremely speculative exercise. As such, the team sees these business lines as strong catalysts, with high potential upside.

The company's consensus cost of capital (Bloomberg, as of November 9, 2018) is ~11.4%. While financial convention may suggest that investing in Facebook is an NPV-negative proposal at an estimated IRR of 10.4%, the team believes that Facebook's IPO coinciding with the longest bull market in recent history, paired with tremendous growth since, yields a deceivingly high beta, and as such, a deceivingly high CAPM cost of equity. Further, the 10.4% estimated IRR exhibits a highly conservative set of assumptions. Under this estimated return profile, with WhatsApp and Oculus as additional free options, the team would feel comfortable deploying additional capital in what is one of the world's best businesses. The costs associated with compliance have made Facebook a less profitable business in the short-run, but in the long-run will widen its moat and allow Facebook to continue growing and compounding capital.

EXHIBIT XVII

Sensitivity of Estimated Unlevered IRR

				FCF Exit Multiple			
MAU	**ARPU**	**21.6x**	**22.6x**	**23.6x**	**24.6x**	**25.6x**	**26.6x**
Bear	**Bear**	6.3%	6.6%	**7.0%**	7.3%	7.6%	7.9%
Bear	**Base**	8.4%	8.8%	**9.1%**	9.5%	9.8%	10.1%
Bear	**Bull**	11.2%	11.6%	**12.0%**	12.3%	12.6%	13.0%
Base	**Bear**	7.5%	7.9%	**8.2%**	8.6%	8.9%	9.2%
Base	**Base**	**9.7%**	**10.1%**	**10.4%**	**10.8%**	**11.1%**	**11.4%**
Base	**Bull**	12.5%	12.9%	**13.3%**	13.6%	14.0%	14.3%
Bull	**Bear**	8.6%	9.0%	**9.4%**	9.7%	10.0%	10.4%
Bull	**Base**	10.8%	11.2%	**11.6%**	11.9%	12.3%	12.6%
Bull	**Bull**	13.7%	14.1%	**14.4%**	14.8%	15.1%	15.5%
					Average IRR		**10.8%**

Under Base Case assumptions, Facebook exhibits an estimated unlevered IRR of 10.4%

While consensus WACC is ~11.4%, the team believes this overstates the overall riskiness of the business

Given the results of a conservative analysis, and the free upside of WhatsApp and Oculus, the team would like to add to its position in Facebook and increase its active weighting

Source(s): Capital IQ

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