Cloud Infrastructure

A 4Q20 Preview of AWS, Microsoft Azure and Google Cloud

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Software

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Summary

As we approach the 4Q20 reporting season for Microsoft, Amazon and Google, we share our thoughts about their cloud infrastructure segments Azure, AWS and Google Cloud, respectively, after speaking to over a dozen customers and partners over the last few weeks. Our focus was on the pace at which cloud migration discussions and deal commitments are likely to convert to actual go-lives and usage for the Big Three cloud providers in 2021 and the potential impact on our estimates for Azure (covered by Karl Keirstead) and AWS and Google Cloud (covered by Eric Sheridan). We are hosting an investor call at 11am ET on Thursday January 21st to summarize our views.

Key Insights From our Checks

For context, we concluded in our 3Q20 Cloud preview three months ago (see note HERE) that given go-live delays on new large migration projects as well as continued cost optimization efforts, 3Q20 was unlikely to show a material recovery in growth rates from the Big Three cloud providers. Today, as we assess the data points in this note, we conclude that the embrace of the public cloud infrastructure model likely picked up steam in 4Q20, at a faster clip than we were thinking 3 months ago. We still believe that much of the upside in usage or consumption from prior-period deal commitments (both pre-COVID and post-COVID) will come in 2021, but 4Q20 definitely felt sequentially better than 3Q20.

Read-through to Microsoft, Amazon and Google

Bottom line, we believe that the growth rates to be posted by Microsoft, Amazon and Google in their respective cloud segments over the next several quarters could outperform expectations and this helps to drive our positive view of these mega-caps. For Microsoft, we are modeling Azure growth of 42% (buy-side consensus is a bit higher) and we'd point out that an acceleration in growth at some point in 2021 is NOT yet in the stock. For Amazon, we are modeling AWS growth of 28%, in line with buy-side consensus growth, while for Google we're modeling Google Cloud growth of 45%, with the buy-side consensus slightly higher at 45-46%.

Overall Growth Trends

Let's start by hitting head-on the question of how overall demand for public cloud infrastructure services tracked during 4Q20. First, let's take a quick step back and summarize the trends we saw in 3Q20.

Backdrop – Growth Stabilization in 3Q20

While reported growth rates by each of the Big Three remain extraordinary given the scale of these businesses, each of Amazon, Microsoft and Google posted decelerating y/y cloud revenue growth in each of 1Q20 and 2Q20 on the back of the economic downturn and each cloud provider also posted a y/y decline in dollar sequential revenue growth in 2Q20 (which we know for AWS and Google Cloud but need to estimate for Azure). In contrast, 3Q20 was a quarter marked by stabilization, with the combined revenues of $21.4 billion from the Big Three representing 37% growth, stable with 36% in 2Q20. Combined sequential dollar growth of $1.77 billion was the 2nd-strongest quarter ever, matched only by 4Q19, the last quarter before the pandemic hit. Among the big cloud providers, only Microsoft offers any hint at growth metrics for its cloud segment, with Azure expected to grow in the "low-40%" zip code in 4Q20. Assuming growth comes in at 43%, this would equate to sequential dollar growth of ~$650 million – a record quarter for Azure. Bottom line, we believe the transition from deceleration to stabilization in this market is well under way.

Figure 1: Y/Y and Sequential Growth Trends ($ in millions)

	CY18	CY19				CY20E				CY21E	
	4Q Dec-18	1Q Mar-19	2Q Jun-19	3Q Sep-19	4Q Dec-19	1Q Mar-20	2Q Jun-20	3Q Sep-20	4Q Dec-20E	1Q Mar-21E	2Q Jun-21E
AWS											
Revenue	7,430	7,696	8,381	8,995	9,954	10,219	10,808	11,601	12,741	12,927	13,564
% Y/Y Change	*45%*	*41%*	*37%*	*35%*	*34%*	*33%*	*29%*	*29%*	*28%*	*27%*	*26%*
Sequential Dollar Growth	751	266	685	614	959	265	589	793	1,140	186	637
% Y/Y Change	*42%*	*-19%*	*3%*	*7%*	*28%*	*0%*	*-14%*	*29%*	*19%*	*-30%*	*8%*
Azure											
Revenue	3,032	3,398	3,967	4,307	4,911	5,403	5,832	6,374	6,960	7,559	8,065
% Y/Y Change, c/c	*76%*	*75%*	*68%*	*63%*	*64%*	*61%*	*50%*	*47%*	*42%*	*40%*	*38%*
Sequential Dollar Growth	323	366	570	339	605	491	430	542	586	599	506
% Y/Y Change	*76%*	*49%*	*26%*	*17%*	*87%*	*34%*	*-25%*	*60%*	*-3%*	*22%*	*18%*
Google Cloud											
Revenue	1,709	1,825	2,100	2,379	2,614	2,777	3,007	3,444	3,790	3,888	4,511
% Y/Y Change					*53%*	*52%*	*43%*	*45%*	*45%*	*40%*	*50%*
Sequential Dollar Growth	N/S	116	275	279	235	163	230	437	346	98	623
% Y/Y Change						*41%*	*-16%*	*57%*	*47%*	*-40%*	*171%*
Total Revenue	**12,171**	**12,919**	**14,448**	**15,681**	**17,479**	**18,399**	**19,647**	**21,419**	**23,492**	**24,374**	**26,140**
% Y/Y Change					*44%*	*42%*	*36%*	*37%*	*34%*	*32%*	*33%*
Total Sequential Dollar Growth	**NA**	**748**	**1,530**	**1,232**	**1,799**	**919**	**1,249**	**1,772**	**2,073**	**882**	**1,766**
% Y/Y Change						*23%*	*-18%*	*44%*	*15%*	*-4%*	*41%*

Source : Company filings, UBSe

Feedback from Industry Checks

Over the last month or so we spoke to ~15 enterprise customers and partners to sharpen our view of demand trends, in particular to determine whether the stabilization in cloud infrastructure usage that we saw in 3Q20 would continue into 4Q20 and to refresh our view of cloud infrastructure adoption in 2021. See the unvarnished feedback below:

- *More of the large banks are investing in digital transformation, such that the portion of revenues spent on IT is now about 7% on average, with the large banks at 10%+. Some of the mega-banks such as JPMorgan and Bank of America are still spending to refresh and modernize their on-premise infrastructures. They still run mainframe-based systems that are too expensive to re-factor. Mid-sized banks that don't have any scale advantages need to invest more in the cloud to achieve added flexibility* *gains.*

- *About 85% of our infrastructure today is on-premise and it is shrinking such that we don't plan to build any more of our own data centers. We're content having our fixed-capacity workloads running on-premise but all of our new software applications are going to Azure and AWS.*

- *We run our Splunk deployment on-premise and we even migrate our log data from applications hosted in Azure back on-premise. This data is simply too expensive to store in Azure. Storage equipment and costs are now so low that on-premise storage is cheaper than in Azure.*

- *We have accelerated our use of AWS/Azure since the COVID crisis hit, it has accelerated our digital journey as we recognized that we were not as digital as we needed to be.*

- *The typical timeframe for an enterprise to move from deal commitment to actual usage or consumption of AWS/Azure is 9 months. Given that a lot of the post-COVID uptick in discussion and planning for a faster cloud migration started in earnest in 3Q20, we think that usage (and hence revenue recognition) will likely ramp perhaps in 3Q21, maybe even 4Q21. On some deals, the usage can be back-end loaded. For instance, we were recently part of a SAP-to-Google migration deal, $9 million over 3 years. Google is essentially rebating the first year of proceeds to us, paying us to help the customer with all the up-front migration services. There is also the lingering impact of customers optimizing their cloud spending, finding ways to consolidate spending in order to secure larger price discounts via volume commitments. Bottom line, there is definitely an increase in cloud infrastructure migration activity post-COVID, and activity levels feel stronger in 4Q20 than in 2Q20/3Q20, but it is not yet a flood or avalanche, more like a steady acceleration of the multi-year opportunity.*

- *We are increasing our commitment to AWS, mostly for data analytics workloads, less so on operational workloads such as our SAP systems, which are slower to move.*

- *We were forced to make material IT budget cuts post-COVID, but at the same time we've accelerated our adoption of cloud infrastructures, such that we announced a "cloud-first" strategy at the end of 2020 and plan to accelerate in 2021. We are choosing our primary vendor now and have issued an RFP to AWS, Microsoft Azure and Google Cloud.*

- *We use AWS as our primary cloud vendor, with a small portion going to Azure. Most of our new software development is cloud-centric and we're early stage (less than 20% done) in refactoring and migrating existing applications. COVID had no real impact on this journey, as we're in the healthcare vertical and have managed through the crisis well and haven't felt forced to change course.*

- *We're accelerating our move to the cloud post-COVID. We're trying to repurpose traditional on-premise apps and host them either on our own private cloud or on AWS/Azure. Of our client-facing apps, 65% run on-premise and 35% are in the cloud, 70% of which are in AWS, 28% in Azure and 2% in Google Cloud. This on-premise to cloud shift will really take off in April/May 2021.*

- *We saw some initial lull in demand when COVID hit but saw a very strong rebound in activity in late summer 2020. Enterprises are using this opportunity to modernize, those that were on the fence realize they need to be cloud-native. In terms of the pace at which migration planning activity is converting first to deal commitments and then to actual usage, it depends on the industry but the conversion process seems to be steady rather than a material inflection. We're not seeing any material share shift between the Big Three and in terms of pricing, it is relatively stable largely because AWS doesn't play that game, when there is steeper-than-normal discounts it is usually from Google.*

- *We're a Google Cloud partner and 4Q20 felt like a strong quarter for GCP generally. Google continues to win new deals in the enterprise - e.g. they've done well at Unilever. I believe GCP is growing 60%+ y/y, with Workspace growing slower. Their challenge remains really big migrations, but it's starting to feel like it will come as part of the larger transformations they're now securing.*

- *We are a reseller of Citrix, VMware, Microsoft and other technology partners. One clear trend in 4Q20 was the uptick in activity around migrating Citrix workloads to Azure from on-premise. Customers stalled their cloud migration activity for several quarters after the COVID crisis hit as they dealt with other priorities, but in 4Q20, we started to see some migrations move forward, accompanied by customers reducing their leased data center footprints and retiring portions of their own data centers. A lot of this migration planning activity picked up in the September 2020 timeframe after the initial post-COVID panic started to fade. This can often take 6+ months to convert to usage, so if I had to guess, I'd say that AWS/Azure usage starts to pick up in 2Q21, with the real ramp occurring in 2H21.*

- *Perhaps the biggest push-back to the public cloud model is the cost, many enterprises experienced sticker shock and workloads proved to be cheaper to run on-premise. We've even seen some peers repatriate workloads from AWS back to on-premise. This dynamic shifted in 2H20, with the biggest change being more attractive pricing from AWS for certain tier-one workloads. I'll give you one example – in January 2020, running a VDI workload on AWS was literally 10x more expensive on a TCO basis compared to running it on-premise given AWS S3 storage costs and other factors. Today, after some very aggressive moves by AWS, it is just 10-15% more expensive to offload to AWS. Now, I'm intrigued. I'm still maintaining an on-premise infrastructure that I am planning to depreciate-out and squeeze the life out of for as long as I can, but most new workloads are now going to AWS.*

- *We're a large reseller and my prediction is that 2021 will go down as the biggest cloud migration year ever. Migration activity is picking up every month, a steady incremental improvement.*

Solid (Not Amazing) New Deal Activity

At the time of the March-April 2020 crisis, we heard of new cloud infrastructure deal activity delays. These delays appear to have eased in 2Q20 and 3Q20, evidenced not only by the number and quality of announced new deals but also by the backlog data disclosed by Amazon and Google for AWS and Google Cloud, respectively (see data later in this report). In Figure 2 below, we list all the publicly disclosed deal announcements in 4Q20 that we could find. Frankly, this list is solid but isn't as impressive as what was announced in 3Q20.

Figure 2: New Deal Activity

Amazon
10/08 Carrier
10/13 Takeda Pharmaceutical
11/30 Zoom (expansion)
12/07 MGM
12/08 ViacomCBS
12/10 BP
12/15 Twitter
12/18 Vyaire Medical

Microsoft
10/06 Rockwell Automation
10/07 ZEISS
10/08 GameStop
10/18 Migros
10/22 Honeywell
10/22 Alaska Airlines
12/10 Deutsche Telekom (expansion)

Google
10/14 Nokia
10/15 Department of Energy
10/15 State of West Virginia
10/21 State of Rhode Island
10/22 Canadian Federal Government (expansion)
11/23 ABB Information Systems
12/07 Rubin Observatory
12/08 Rice University
12/17 Highmark Health Partners

Source : Company press releases

On-Premise Spending – Still Mixed

Intuitively, one would think that any acceleration in on-premise to cloud migration activity would show up not only in strong reported usage growth for AWS, Microsoft Azure and Google Cloud, but also in weak reported financial metrics from the large on-premise infrastructure firms such as Dell, Cisco, HPE, NetApp and VMware that would be on the opposite side of any migration activity boost. This would be especially true of their server, storage and networking segments. Of course, the correlation is imperfect, as enterprises might be accelerating plans to migrate tier-one workloads to the cloud AND refreshing their on-premise corporate data centers at the same time. That said, the results of the large on-premise infrastructure firms are worth monitoring as another input to gauge the likely strength of cloud migration activity. For this task, we monitor the public results as well as relying on insights from the UBS hardware team (led by David Vogt).

The stocks of many hardware firms (Cisco, Dell, HPE, NetApp) have rallied sharply since late-October, based on a combination of better-than-feared recent results as well as an investor rotation into cheaper technology stocks perceived to be beneficiaries of a post-pandemic economic rebound. For our purposes, we're less interested in expectation beats and more in what the results from the big hardware vendors say about the state of on-premise infrastructure spend and by implication, what they might say about the pace of critical workloads migrations to the cloud. Through this lens, the most recent results from the hardware firms lead us to conclude that while demand appears to have bottomed and is stabilizing, there is NOT a material on-premise infrastructure spending recovery going on and therefore that planned workload migrations to AWS, Microsoft Azure and Google Cloud are likely still on track.

- **Dell:** Revenues in Dell's Infrastructure segment were -4% y/y and -2% sequentially, although server demand improved. Dell said that for the current quarter "we expect revenues to track slightly lower than last year's 4% sequential growth based on continued softness in data center spend".

- **HPE:** Revenues were flat y/y although +5% sequentially (note that this may understate the growth as the prior quarter benefitted from a one-time inventory drawdown driven by COVID normalization).

- **NetApp:** Revenues were +3% y/y (+2% in c/c) and for this current quarter are expected to be +1% y/y (flat c/c).

- **Cisco:** Revenues were down 9% y/y, with "Infrastructure platform" revenues -16% and the Enterprise segment -15%. For the current quarter, Cisco guided to revenue growth of -2% to flat y/y.

What We Heard

We asked a few of our customer and partner checks what they're seeing in terms of on-premise infrastructure spend. We heard:

- *I've heard my peers announce that this on-premise refresh cycle is the last one before everything moves to the cloud. I agree, eventually everything will end up there but until then, we'll still have to hit refresh at least once more. I'd say 30-40% of my CIO peers added on-premise infrastructure capacity in 4Q20. Our on-premise infrastructure is not going away, largely because the apps running on-premise are not leaving any time soon.*

- *On-premise spending is hardly going to zero, as lots of applications are not being migrated to AWS/Azure any time soon. However, we're not seeing much if any of an uptick in spending on new server, storage and networking equipment.*

Tailwind from SolarWinds Hack

The high-profile SolarWinds cyber-security attack in December had a number of ramifications on Microsoft that we detailed in a recent note (see HERE), but one consistent piece of feedback from our industry checks relevant for readers of this note was that the SolarWinds attack will likely push enterprise and government customers to the public cloud infrastructure model even faster, on top of the acceleration that we're already witnessing post-COVID.

Cloud Data Centers Are More Secure

One argument is that cloud environments will increasingly be seen as more secure fabrics and that the SolarWinds hack simply illuminated the risk associated with managing on-premise software. As one check said, "this serves as a powerful argument against on-premise software", noting that customer workloads on Azure, AWS or Google Cloud have not been compromised. Many checks argued that Microsoft (and Amazon and Google) has more in-house security expertise and a larger security R&D budget than any single customer, and utilizing Azure enables customers to leverage this expertise. One check went so far as to argue that Microsoft has a better security reputation compared to Amazon (which has suffered from some high-profile S3-related breaches, including the Capital One breach in 2019) and that Microsoft should, and likely will, market this perceived advantage going forward. Others expressed a view that the security difference between the Big Three cloud providers is minimal.

Have the Cloud Vendors Worry About Patching

The consensus view of the cyber-security industry is that the root cause of this attack was the injection of malicious code into an update or patch for existing SolarWinds Orion network management software. Importing 3rd-party on-premise software updates is a frequent exercise and one that exposes organizations to security risk, as various parts of a large organization might be using different versions of a software product and are patching on different schedules. This creates vulnerability that can be mitigated by off-loading these workloads into Microsoft Azure, AWS, Google Cloud or SaaS data centers, given that these cloud providers are responsible for maintaining their software infrastructures and are always pushing updates of the most current versions of software to their customers. Put another way, the 3rd-party cloud providers have a much smaller vulnerability or attack surface. As one check said, "Legacy software is the Achilles heel of corporate networks. In contrast, Azure and AWS run the latest and greatest versions of everything, they are always up-to-date". This argument was made best by one industry check in the following excerpt:

"I think COVID really accelerated the migration to cloud. I mean, everyone was already pretty much going there, or at least most organizations were already going there. I think this just poured gasoline on that movement. If you can start to say, 'You know what, we shouldn't be worrying about this anymore. We shouldn't have humans that are worried about patching software and things like that. If we can have Salesforce or Workday or some of these other systems where they're responsible for just updating the software and pushing new customer-facing features and things like that, and we just use the product and manage a little bit of the access and security around it,' I think that's just further acceleration of the movement of this situation, a further acceleration of the movement. I don't think there's been a lot of identification of any kind of weakness of the data centers of the clouds themselves. It's really abusing that trust mechanism, so it's getting into your kind of on-prem authentication mechanism, identity mechanism, and then using that to say, 'Hey, I'm already authenticated, let me log into different cloud services, different SaaS apps, etc'.

It's more of an IT problem than a security problem here. It's really just trying to keep up with IT updates, having very complicated IT systems, just having this mishmash of 20-year-old software mixed with bleeding-edge software in your environment and everything in between, and trying to have some cloud and SaaS and CaaS assets and systems mixed with on-prem legacy stuff. So, I would say that it's just going to further accelerate the adoption of cloud-based software whether it's pushing your own applications into Amazon, Microsoft, Google, etc., or again, you're trying to get more into the SaaS world trends that were already occurring, but this is just a further acceleration of that. The first question is if your team can execute better in terms of patch management and updates and security than Amazon, Google, Microsoft, Salesforce, some of these environments where they're charged with the protection of, thousands, tens of thousands, hundreds of thousands of customers, and I would say most organizations if they're being honest, they would say, 'There's no way we can execute and operate like these major organizations.'"

The JEDI and DISA Cloud Contracts

The consensus view of our checks was that the hack would likely motivate US government departments and agencies to embrace the cloud model more earnestly. The big JEDI cloud computing contract has already been awarded to Microsoft (over AWS), but one check pointed out that just weeks ago, DISA (the US Defense Information Systems Agency) issued the final RFP for a 10-year cloud computing contract potentially worth $11.7 billion to consolidate the Pentagon's non-military (or 4th estate) systems. Two of our checks argued that this cyber-attack on the US government will not slow down this deal or the overall government appetite to move to the cloud model, citing (as we mention above) the benefits of instant mass patching/updating that is available via cloud providers and the assertion that this attack was not targeted at Azure or AWS, but rather on-premise networks. This check said that AWS might attempt to use the SolarWinds breach, and the fact that Microsoft Azure AD and Office 365 were compromised, as competitive marketing fodder for the big DISA contract pitch, but that a) this wouldn't be a compelling argument and b) AWS is heavily favored to win the DISA contract anyway, given the tight existing DISA-AWS relationship and given the likelihood that the DoD will look to diversify its cloud providers after awarding the JEDI contract to Microsoft.

UBS View – Migration Activity Picked Up in 4Q20

Let's step back and assess all the data points cited above and how they compared to our 3Q20 Cloud preview (see our note here). In this October 2020 note, we wrote:

"Our sense from these customer and partner conversations was that Azure, AWS and Google Cloud usage still tracked at a solid clip during 3Q20, especially from organizations in less-impacted industries. However, a larger-than-normal portion of our checks, including many of the larger AWS partners that we spoke to, flagged continued hesitation in new cloud migration activity, due largely to the uncertain overall environment, as well as a continued focus on cost containment for workloads already running in Azure, AWS and Google Cloud. The much-anticipated post-COVID migration activity uptick doesn't sound like it occurred in 3Q20 and we'd be surprised if it occurred in 4Q20. Rather, we believe that investors should brace themselves for modest revenue upside in 2H20 and the start of a more meaningful demand acceleration in 1H21".

By and large, we weren't too far off, as Microsoft Azure again decelerated, AWS growth stabilized and Google Cloud growth slightly accelerated in 3Q20. As we assess the data points above, we conclude that the embrace of the public cloud infrastructure model likely picked up steam in 4Q20, at a faster clip than we were thinking 3 months ago. We still believe that much of the upside in usage or consumption from prior-period deal commitments (both pre-COVID and post-COVID) will come in 2021, and on the margin the anecdotes above give us even stronger conviction that this will occur. Bottom line, we still believe that the growth rates to be posted by Microsoft, Amazon and Google in their respective cloud segments could outperform expectations and help to drive our positive view of these mega-caps.

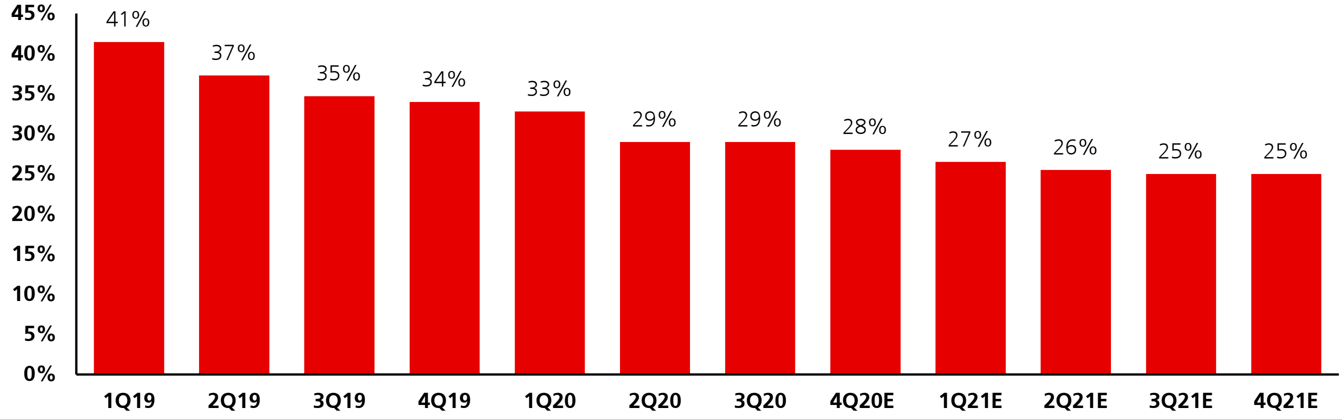
Amazon Web Services

Let's now discuss the company-specific trends and estimates, starting with the largest of the cloud players, Amazon Web Services. Our estimates below come via our Amazon research coverage team, led by Eric Sheridan.

Our 4Q20 and 2021 Estimates

From a base of 29% revenue growth in 3Q20 (stable with 2Q20), we believe that the buy-side consensus is for AWS growth of 28% in 4Q20 (in line with sell-side consensus of +28%). We are modelling a slight deceleration to 28% AWS growth in 4Q20, implying sequential dollar growth of $1.14 billion. This would represent a record sequential dollar improvement for AWS, with the previous high being the $959 million added in the year-ago 4Q19 quarter. For 2021, we continue to conservatively model AWS growth of 25%. In terms of margins, we estimate AWS GAAP operating margins of 30% in 4Q20 and 30% in 2021, down 40bps y/y.

Figure 3: AWS Growth Trends

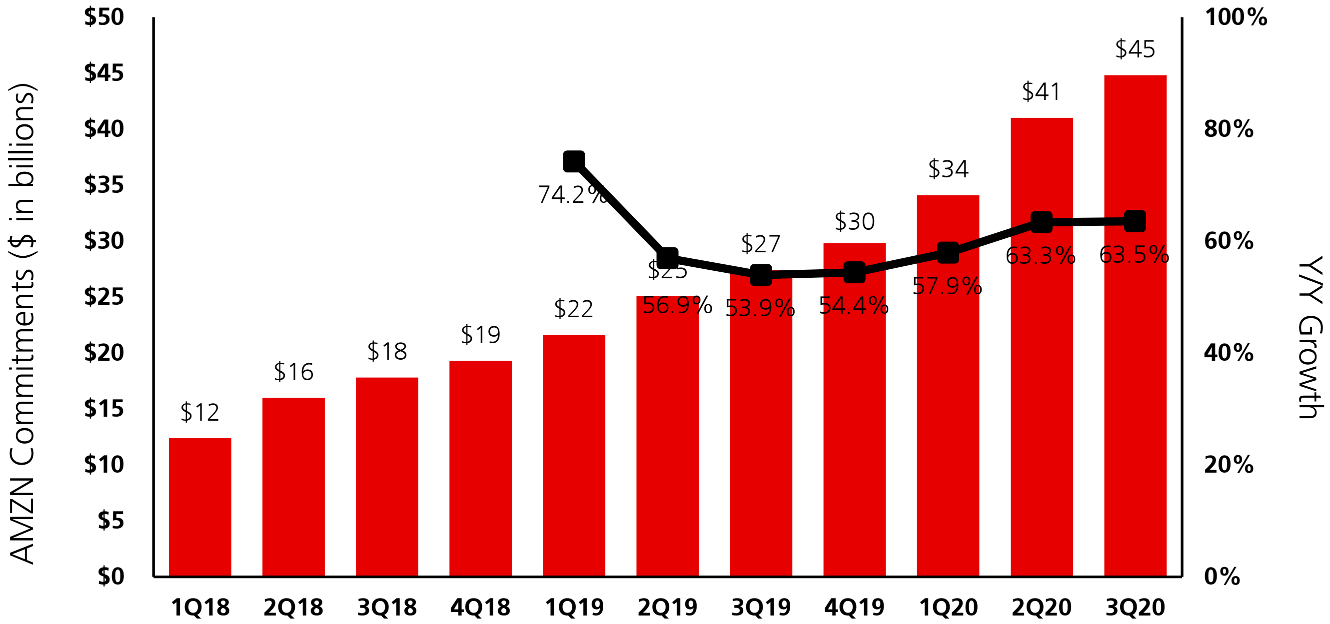


Source : Company filings, UBSe

60%+ Backlog Growth

As we show in Figure 4 below, AWS has posted impressive backlog growth, with the backlog ramping to $45 billion at the end of 3Q20, up 64% and the 3rd consecutive quarter of backlog growth acceleration. Note that his does not include unearned revenue accounted for on the balance sheet, a portion of which is attributable to AWS. This widening gap (now over 2x) between revenue growth (based on in-period usage or consumption) and backlog (a future commitment) can best be explained by large enterprises signing larger and longer-term commitments that show up as usage down the road, and also by the desire to secure better near-term pricing by signing larger and long-term volume commitments. This backlog data gives us comfort in the AWS growth trajectory over the next several years.

Figure 4: AWS Backlog Growth



Source : Company filings; Note: Amazon's commitments for future services reflects AWS contracts with original terms >1 year that have not been recognized in financial statements.

Growth from AWS Partners - Snowflake, Zoom and Others

As we and others have written before, there is some industry vertical differences between the Big Three cloud providers. Retail customers, for instance, have been reticent about using AWS and have flocked to Microsoft Azure and Google instead, while many technology firms have been more comfortable partnering closely with and running on AWS. Fortunately for AWS, and unfortunately for Microsoft and Google, this trade-off has swung materially in Amazon's favor, as retail IT spending is under pressure post-COVID while enterprise technology spend has held up surprisingly well.

Below we highlight the growth of two of the larger technology customers/partners of AWS, Zoom and Snowflake. These two customer alone might have increased their spending with AWS by $134 million y/y and $41 million sequentially. This is for just two AWS-centric technology firms, we could add Datadog (61% growth in 3Q20), Splunk Cloud (80% growth in 3QF21) and several others. To put this in perspective, our Amazon research team (led by Eric Sheridan) expects AWS revenues in 4Q20 be up $2.8 billion y/y and $1.1 billion sequentially. Our point is that the growth software vertical exposure of AWS could prove to be a real growth catalyst, one that differentiates AWS from Microsoft Azure that has higher exposure to customers migrating traditional (albeit "heavy") software products such as SAP and Citrix. This vertical exposure difference could be one factor to keep in mind if AWS posts accelerating growth in 4Q20 while Azure continues to decelerate.

- **Zoom:** The majority of Zoom traffic runs via public cloud infrastructures, although Zoom is clear that its own data centers are cheaper such that it plans to add data center capacity. In late-November 2020, Zoom announced a multi-year "preferred" provider deal with AWS, saying that a "substantial majority" of its cloud-based workloads run on AWS. This deal should boost the AWS backlog figure for 4Q20. Note that in Zoom's 3QF21/Oct 20 quarter, its Cost of Revenues (a portion of which is AWS hosting expenses) were up over 8x or $228 million y/y and $66 million sequentially. If half this sequential increase in COGS related to AWS hosting costs, that's a $114 million y/y and $33 million sequential increase in AWS revenues from a single technology customer.

- **Snowflake:** We estimate that ~90% of Snowflake's product COGS is for 3rd-party cloud infrastructure expenses, 85% of which is to AWS. In July 2020, Snowflake signed an amended 5-year agreement with AWS for $1.2 billion in committed/ minimum spend, a deal that likely boosted the AWS backlog figure for 3Q20. In

Snowflake's 3QF21/Oct 20 quarter, its product COGS were +110%, with the portion spent with AWS up an estimated $20 million y/y and $8 million sequentially.

Insights from re:Invent 2020

Although the virtual format of the big AWS re:Invent conference in early December reduced investor focus on the event, we listened to the keynotes and product announcements. Below we list what we think were the key takes for enterprise tech investors. A few of these announcements, namely ECS and EKS Anywhere as well as the smaller Outposts form factors, accelerate the move on-premise, but we still believe that these on-premise moves by AWS are immaterial. As one large AWS partner told us, they are really just "lip-service" to date.

- **Macro Comments from CEO Andy Jassy:** The one statement from Jassy that caught the attention of investors was that just 4% of total IT spend is now in the cloud, implying a long adoption runway. In our view Jassy is using a generous definition of total IT spend and we'd put the penetration of the cloud infrastructure model somewhere in the 5-10% range (still low to be sure). Jassy also reaffirmed that the COVID crisis has accelerated the move from talking and dipping toes in the cloud to "real planning". AWS highlighted the AWS adoption from large enterprises such as JPMorgan, GE and Capital One.

- **AWS 5th Largest Enterprise Tech Company:** According to AWS, it is now the 5th-largest enterprise technology company based on revenues behind only Microsoft, Dell, IBM and Cisco. We believe that based on market capitalization, AWS would rank behind only Microsoft among enterprise technology firms if it were standalone and publicly traded.

- **Containers Move On-Premise:** AWS announced that in 2021, it will launch on-premise versions of its ECS (Elastic Container Service) and EKS (Elastic Kubernetes Servicer) offerings that customers can deploy in their own data centers, in addition to open-sourcing its EKS distribution. In our view this is in response to customers increasingly building new apps (developed on-premise but destined for the cloud) using container technology. This makes the market for container-based software development platforms even more crowded, joining IBM Red Hat as well as VMware (with Tanzu and Pivotal) in this market.

- **Smaller Outposts Form Factors:** In 2019, AWS took a step on-premise via the launch of AWS Outposts, a server rack that customers could deploy in their own data centers that would run many popular AWS services. Microsoft (with Azure Stack) and Google (with Anthos) offered the same. In our view none of these on-premise products have really taken off and AWS admitted that many customers believed that the 80-inch (almost 7-foot high) Outposts server rack was simply too big for most use cases, and AWS responded with the launch of 2 smaller (2-3 inch, pizza box) versions of an Outposts server.

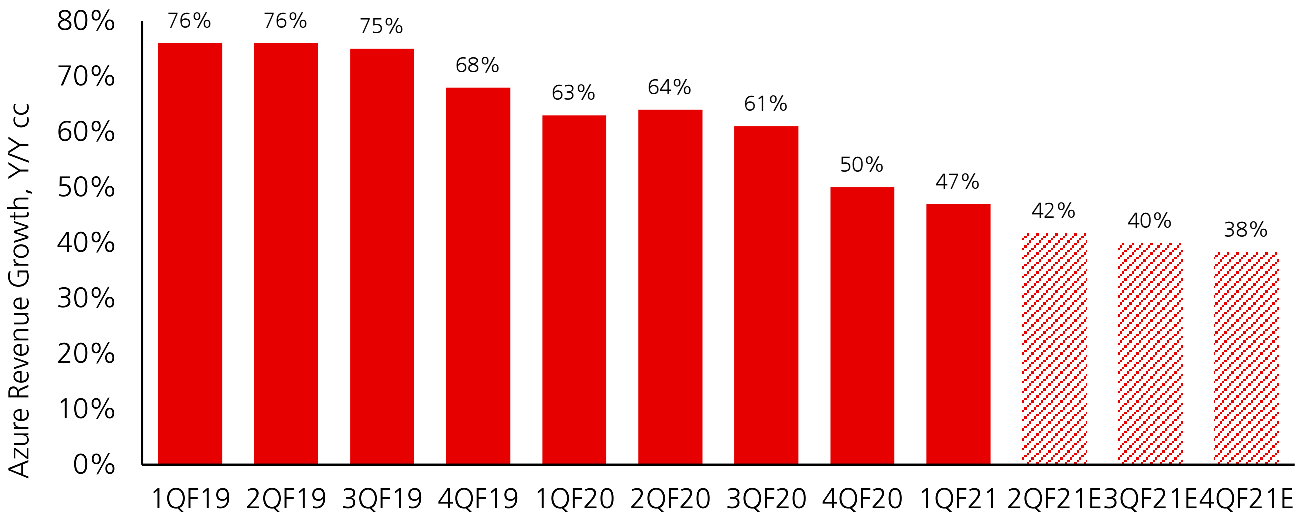
- **Shot at MSFT With Babelfish:** While AWS usually reserves its criticism for Oracle, AWS CEO Andy Jassy took a shot at Microsoft's "punitive" licensing practices and announced a new service called Babelfish, a translation service that makes it easier for customers to migrate their Microsoft SQL Server database workloads to AWS and run them on the Aurora PostgreSQL data service. We do not expect this to materially dent Microsoft's progress with its own Azure SQL database service.

Microsoft Azure

Our 4Q20 and 2021 Estimates

As we show in Figure 5 below, Azure growth has decelerated in each of the last three quarters, due largely to usage pressures stemming from the economic crisis as well as scale. The Street consensus is that Azure's c/c growth will step-down for one more quarter – to the low-40% zip code in 2QF21/Dec. We peg the buy-side consensus at about 43-44% c/c growth for the December 2020 quarter. This is slightly above our published 42% Azure growth estimate, which equates to $586 million of sequential dollar growth, just slightly above the sequential dollar growth in the September 2020 quarter but actually BELOW the $605 million added in the year-ago December 2019 quarter. This increases our confidence in the 42% growth estimate. Starting in the March 2021 quarter, many investors are assuming that Azure growth begins to level out in the high-30% or low-40% range. Microsoft does not appear to be actively talking these estimates down.

Figure 5: Azure Revenue Growth



Source : Company filings, Factset

The Potential for Azure Acceleration in 2021

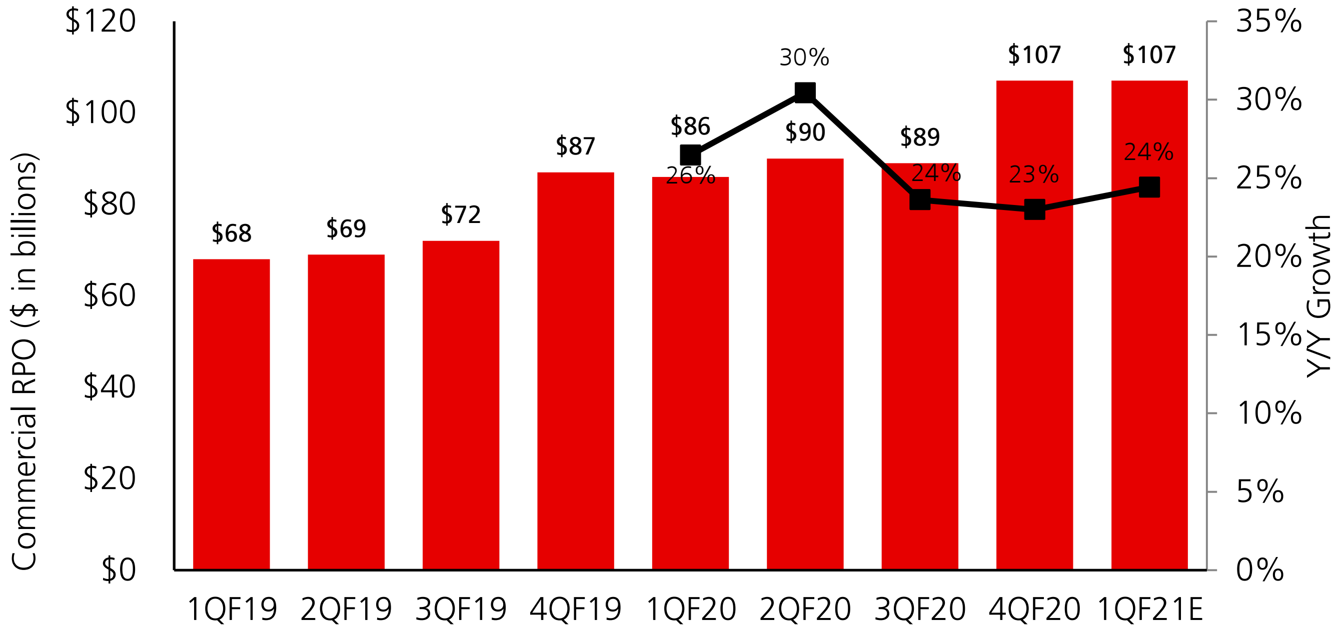
Microsoft continues to push back on the more bullish view that Azure growth could actually accelerate some time in 2021, countering that a) "bending the curve" is tough at Azure's scale (we estimate run-rate revenues of $25 billion), b) the economy remains challenged and c) large migration deals are complex and have a long build-up, such that even if discussions picked up post-COVID, it can take a year for very large organizations just to get the foundational infrastructure plans approved. To this list we'd add that the penetration rate for the EMS/SaaS piece of Azure (~30% of total Azure revenues) is already high and hence the EMS/SaaS portion is now growing more slowly, weighing on reported Azure growth. In our view, an Azure acceleration starting in perhaps the June 2021 quarter (when the y/y compare gets easier) is NOT baked into Microsoft shares and in our view would be an upside catalyst if it were to occur.

That said, it's interesting to examine what it would take for an acceleration to occur. As we showed in Figure 1 at the beginning of this report, we're assuming 42% Azure growth in the December 2020 quarter. For Azure growth to inch up to 43% in 3QF21/Mar against a tough compare, sequential dollar growth would have to be $766 million (+56%). For Azure growth to then hit 45% in 4QF21/Jun, sequential dollar growth would have to be $730 million (+70% against an easy compare). Azure has admittedly never strung together two consecutive quarters of $700+ million of sequential dollar growth (we estimate it reached $600 million in the December 2019 quarter), but in our view this isn't impossible given anecdotes of a material post-COVID increase in the Azure committed backlog as well as the anecdotes above suggesting that migration plans are now going live. For now, we're putting roughly a 30% probability on this acceleration scenario unfolding.

Microsoft Backlog Data

Unlike Amazon and Google, Microsoft doesn't report the Azure deal backlog. Rather, Microsoft only discloses its overall commercial backlog, of which Azure is only a portion. It's therefore tough to interpret too much about Azure from this data, but we offer it in Figure 6 below in part because Microsoft does say that its backlog growth is in fact materially impacted by Azure. We think that Microsoft investors are likely to tolerate another quarter of Azure deceleration in the 2QF21/Dec 2020 quarter as long as the total backlog data and commentary supports the view that Azure deals are signed but just not yet ramped.

Figure 6: Microsoft Commercial Backlog



Source : Company filings, UBSe

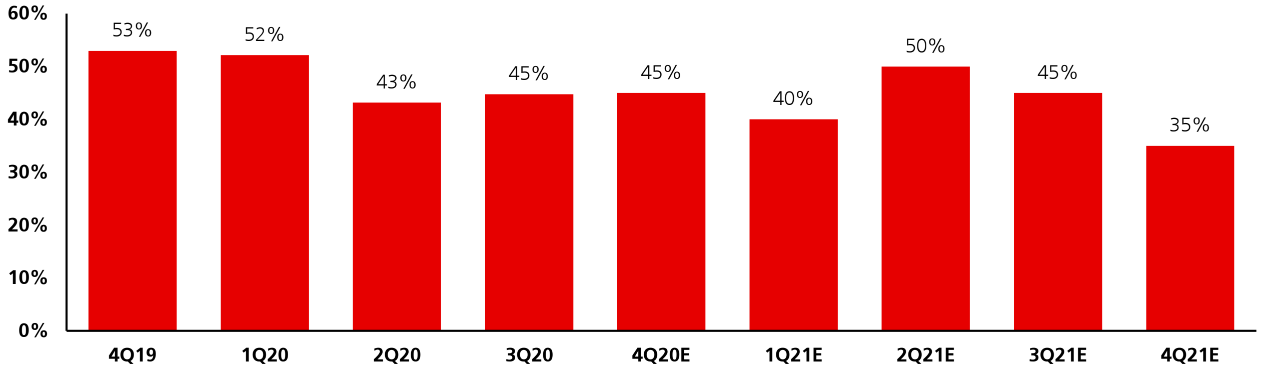
Google Cloud

Our estimates below come via our Alphabet research coverage team, led by Eric Sheridan.

Our 4Q20 and 2021 Growth Estimates

From a base of 43% growth to $3.0 billion of revenues in 2Q20, Google Cloud growth slightly accelerated in 3Q20 to 45%, with sequential dollar growth reaching a record $437 million. To give some perspective on how Google Cloud is closing the gaps with its two larger rivals, sequential revenue growth in 3Q20 was $793 million for AWS and an estimated $542 million for Microsoft Azure (only slightly higher than that of Google Cloud). We believe that the buy-side consensus is for Google Cloud growth of 45-46% in 4Q20. We are modelling Google Cloud growth to remain stable at 45%, which implies sequential dollar growth of $346 million. For 2021, we continue to model Google Cloud growth of 42%.

Figure 7: Google Cloud Revenue Growth

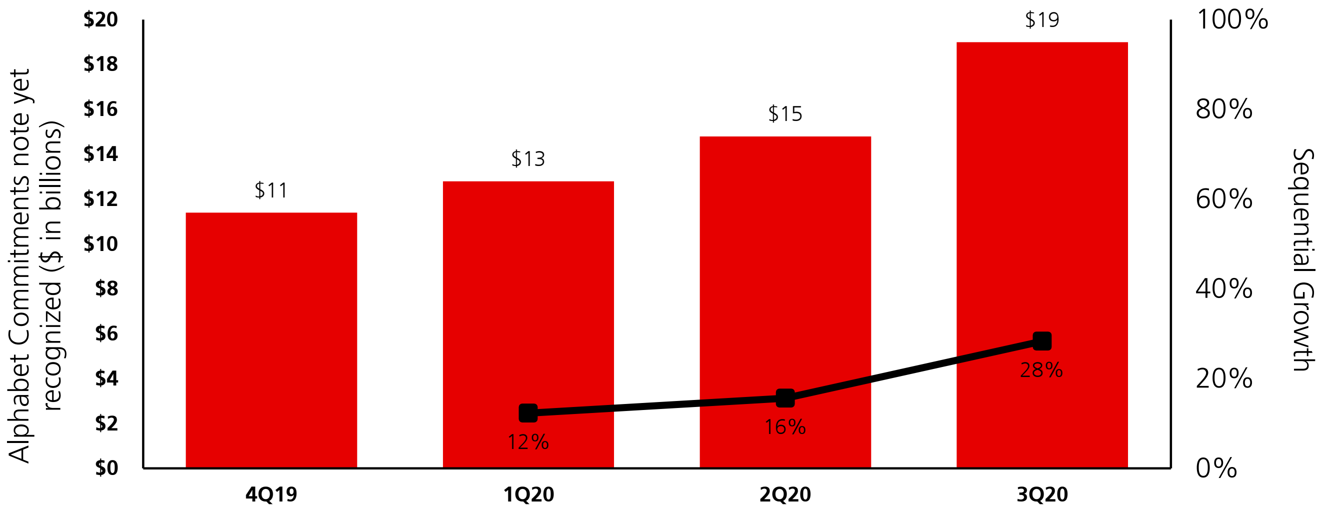


Source : Company filings, UBSe

Backlog/RPO Growth

As we show in Figure 8 below, Alphabet has only disclosed commitments not yet recognized (primarily related to Google Cloud) data for 4 quarters, such that 4Q20 offers an initial view of y/y backlog growth. On a sequential basis, Alphabet added a remarkable $4 billion to the Google Cloud backlog in 3Q20, for sequential growth of 28%. This was in fact equal to the amount by which Amazon grew its AWS backlog sequentially in 3Q20, further evidence of Google Cloud closing gaps.

Figure 8: Alphabet – Commitments not yet recognized as revenue (primarily related to Google Cloud)



Source : Company filings

Shift to Longer-Term Billing

On one of our recent calls, an SI partner told us that a material portion of Google Cloud customers are billed monthly in arrears and that many of these customers now prefer to make up-front volume commitments in order to secure price discounts but also to better plan for their cloud infrastructure expenses. We bounced this assertion off one of our Google Cloud partner checks, who told us:

"Certainly Google is pushing hard on what is basically their equivalent of the AWS EDP, yes. There's a fair bit of interest from customers once they start spending a reasonable amount of money - say north of $120,000/month it starts to become relevant for consideration. Generally, it's a bit of a trend, I would agree, for larger corporate customers and upwards".

The mix of on-demand and "monthly in arrears" billing (which has little if any impact on DR and backlog) compared to longer-term up-front volume commitments is important to keep in mind, in part because it could be impacting reported backlog metrics not only for Google Cloud but also AWS and Microsoft Azure. This could be especially important for Google Cloud and AWS as they move upstream and the portion of their revenues and the backlog from large enterprise customers (many of which prefer to sign multi-year commitments) increases. This may be less of a driver for Azure as a very large portion of Microsoft customers is already on multi-year enterprise license agreements.

Acquisition of Actifio

In early December 2020, Google announced the acquisition of backup (or secondary data) and DR (disaster recovery) management provider Actifio, which will become part of Google Cloud. This represents the 4th notable deal of Google Cloud, following Apigee in 2016 and Looker and CloudSimple in 2019. Both Looker and Actifio are in the data software markets, clearly a focus area of Google Cloud. Although Actifio reportedly closed a funding round at a $1.8 billion valuation in 2018, our checks have signaled over the last two years that Actifio lost material ground to rivals including Cohesity, Rubrik and Veeam and we believe that the acquisition price was likely well below this 2018 valuation level. While we hear that Cohesity is performing relatively well, we wonder what's going on in the market for backup and DR services, as Veeam and Actifio elected to sell in 2020 and in October 2020 Rubrik completed a leadership change that included the departure (in early 2021) of well-regarded CFO Murray Demo. The Google-Actifio deal closed on December 14th, although the impact on Google Cloud's reported 4Q20 numbers is likely small, as we believe that Actifio was in the ~$100 million annual revenue range. One of our checks wondered if Google may have acquired Actifio in order to deploy its DR/backup technology in Google's own data centers.

Valuation Method and Risk Statement

Investing in the technology sector entails above-average risk given low sales visibility, rapid pace of innovation and technological change, intense competition, frequent M&A, and low barriers to entry in many markets.

We value Microsoft on a relative EV/FCF multiple on CY22 estimates. Key risks for Microsoft include the IT spending environment, the pace of decline in legacy businesses relative to growth in newer Cloud-centric businesses, the required capex investment needed to build Cloud datacenters, competitive pressure from Cloud-native leaders like Amazon and Google, and legal and regulatory risk given Microsoft's dominant position in PC operating systems and productivity applications. Microsoft operates in the technology industry which also sees rapid change and innovation, and the company's market opportunity could change rapidly if technology and demand preferences shift in an unanticipated direction.

The rapid pace of evolution in the Internet and Technology sectors, including the emergence of new competition and new form factors of hardware devices, could cause a shift in user behavior that diverts traffic away from Alphabet. Additional key risks include regulatory scrutiny over anti-competitive practices, intellectual property claims, a failure to effectively integrate and manage acquisitions, macroeconomic impacts on global advertising budgets, currency fluctuations, interruption of information technology and communications systems (i.e., natural disasters, terrorism, denial of service attacks, etc.), damage to the Google brand, concentrated voting control, and regulatory risks (particularly ongoing antitrust investigations in the EU). We use an equal blend of EV/GAAP EBITDA multiple and EV/(FCF-SBC) multiple to value Alphabet.

Amazon faces competition from traditional online and offline retailers, search engines, local service websites and companies that provide infrastructure web services. Risks affecting Amazon include the overall health of the macro economy, shifts in consumer spending patterns, seasonality, online regulation (e.g., taxes), and foreign exchange and political risk. Our price target is based on our weighted average approach (EV/GP, EV/EBITDA, EV/FCF), along with two Sum-Of-The-Parts frameworks.

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Buy	FSR is > 6% above the MRA.	51%	31%
Neutral	FSR is between -6% and 6% of the MRA.	37%	29%
Sell	FSR is > 6% below the MRA.	12%	18%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 31 December 2020.
1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

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Company Disclosures

Company Name	Reuters	12-month rating	Price	Price date
Alphabet Inc.[16,7,6b]	GOOG.O	Buy	US$1,790.86	19 Jan 2021
Amazon.com[13,16,7,6c]	AMZN.O	Buy	US$3,120.76	19 Jan 2021
Microsoft Corp.[4,16,7,6a,6b,6c]	MSFT.O	Buy	US$216.44	19 Jan 2021

Source: UBS. All prices as of local market close.
Ratings in this table are the most current published ratings prior to this report. They may be more recent than the stock pricing date

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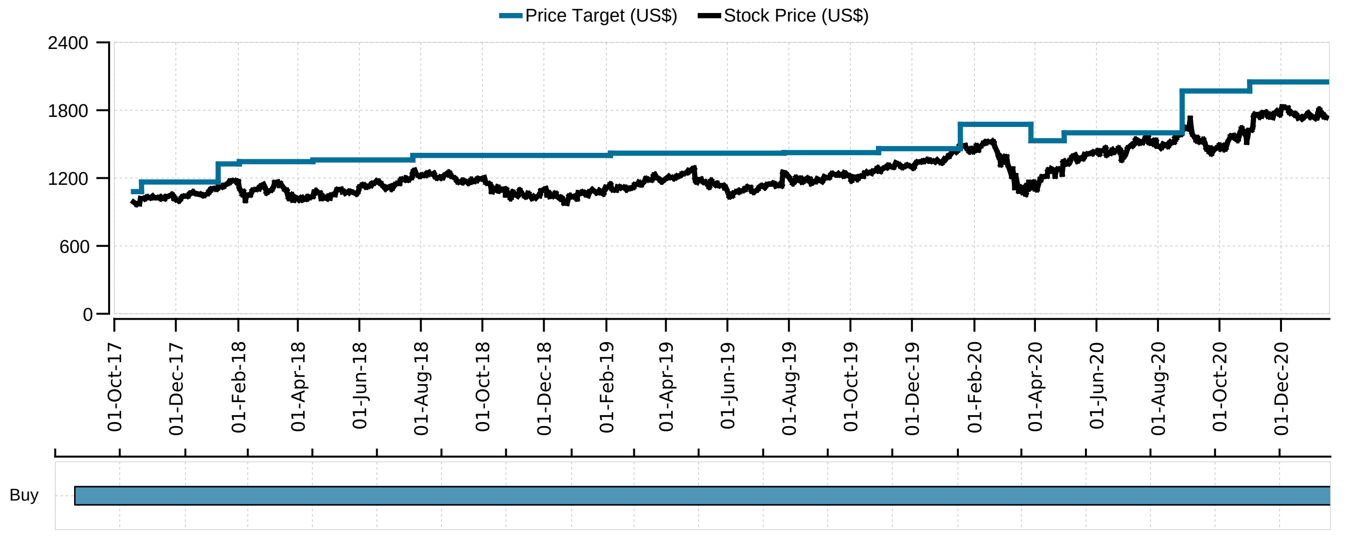
Alphabet Inc. (US$)

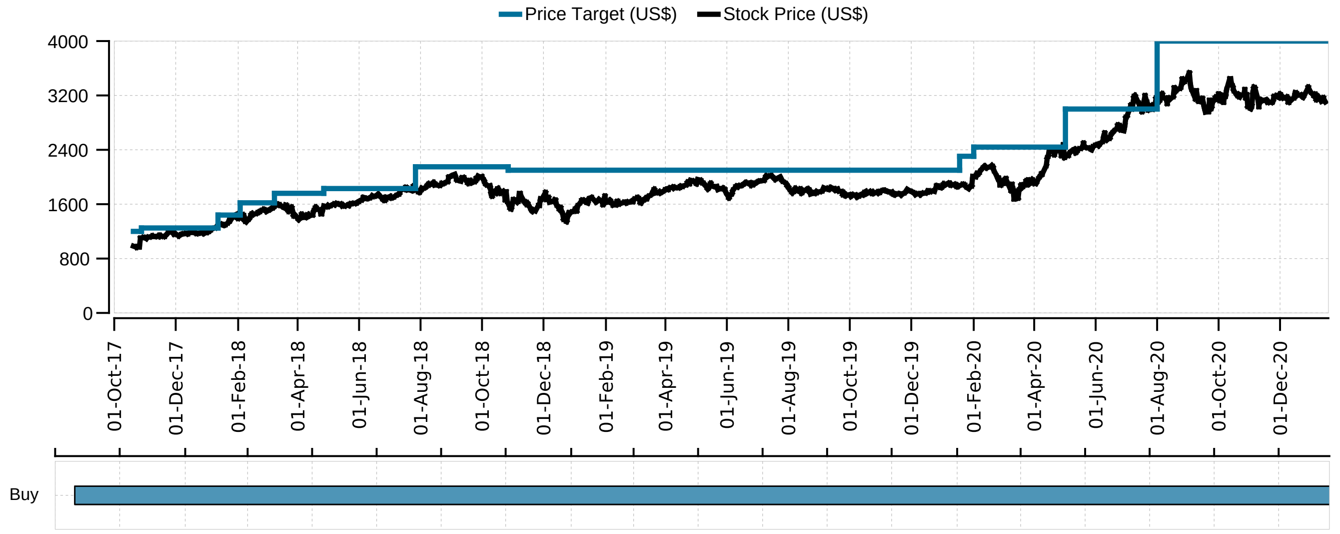


Date	Stock Price (US$)	Price Target (US$)	Rating
2017-10-19	984.45	1080.00	Buy
2017-10-27	1019.27	1165.00	Buy
2018-01-11	1105.52	1325.00	Buy
2018-02-01	1167.70	1345.00	Buy
2018-04-15	1029.27	1360.00	Buy
2018-07-23	1205.50	1400.00	Buy
2019-02-04	1132.80	1420.00	Buy

Date	Stock Price (US$)	Price Target (US$)	Rating
2019-07-26	1250.41	1425.00	Buy
2019-10-28	1290.00	1460.00	Buy
2020-01-17	1480.39	1675.00	Buy
2020-03-27	1110.71	1530.00	Buy
2020-04-29	1341.48	1600.00	Buy
2020-08-24	1588.20	1970.00	Buy
2020-10-30	1621.01	2050.00	Buy

Source: UBS; as of19-Jan-2021

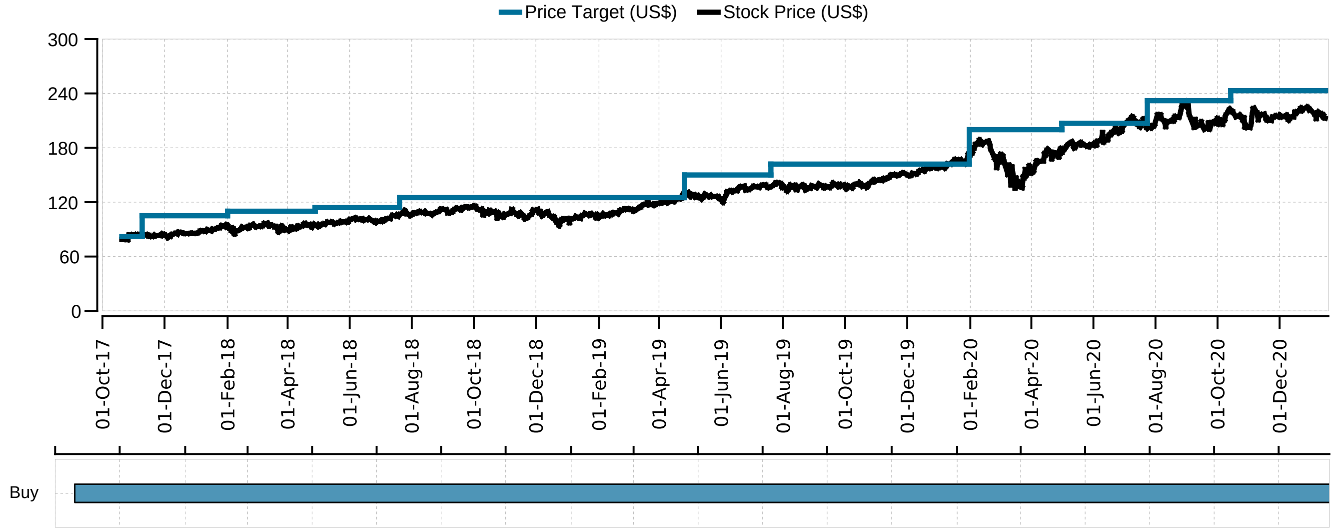
Amazon.com (US$)



Date	Stock Price (US$)	Price Target (US$)	Rating
2017-10-19	986.61	1200.00	Buy
2017-10-27	1100.95	1250.00	Buy
2018-01-11	1276.68	1440.00	Buy
2018-02-02	1429.95	1620.00	Buy
2018-03-08	1551.86	1760.00	Buy
2018-04-26	1517.96	1830.00	Buy
2018-07-26	1808.00	2150.00	Buy
2018-10-26	1642.81	2100.00	Buy
2020-01-17	1864.72	2305.00	Buy
2020-01-31	2008.72	2440.00	Buy
2020-05-01	2286.04	3000.00	Buy
2020-07-31	3164.68	4000.00	Buy

Source: UBS; as of19-Jan-2021

Microsoft Corp. (US$)



Date	Stock Price (US$)	Price Target (US$)	Rating
2017-10-19	77.91	82.00	Buy
2017-11-08	84.56	105.00	Buy
2018-01-31	95.01	110.00	Buy
2018-04-27	95.82	114.00	Buy
2018-07-19	104.40	125.00	Buy
2019-04-25	129.15	150.00	Buy
2019-07-19	136.62	162.00	Buy
2020-01-30	172.78	200.00	Buy
2020-04-30	179.21	207.00	Buy
2020-07-23	202.54	232.00	Buy
2020-10-13	222.86	243.00	Buy

Source: UBS; as of 19-Jan-2021

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