BEHIND THE NUMBERS

Quality of Earnings Analysis

January 8, 2021

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Northrop Grumman (NOC) Earnings Quality Review

6- Exceptionally Strong
5- Strong
4- Acceptable
3- Minor Concern
2- Weak
1- Strong Concern
+ quality improving
- quality deteriorating

We are initiating earnings quality coverage of NOC with a 5+ (Strong) rating.

For an explanation of the EQ Review Rating scale, please refer to the end of this report.

Summary

Northrop Grumman has annual EPS in the $21-23 range and routinely beats quarterly forecasts by more than 50-cents. Given that its largest customer by far is the US government with long-term contracts, there is a base of stability here. There is a 2% dividend that is growing at 10% too. **What we think investors need to be aware of several areas of EPS that are lumpy and can change quickly that each account for about 10% of EPS. The disclosure of these items is very strong in our view and the company tries to update trends for them often. We also find it incredibly refreshing that NOC only excludes one of these items from**

adjusted EPS. Because these are tied to multi-billion contracts and pension plans – small changes in estimates can result in some material EPS moves.

What is strong?

- NOC is not a serial acquirer. It made one acquisition in 2018 - the first since 2002. It didn't overpay at 10.9x EBITDA. It does not add-back amortization of intangibles to adjusted-EPS and is amortizing the assets at rates that appear faster than some PP&E. **The falling amortization expense is providing about 25-30 cents in tailwind to EPS**.

- The Net Debt after the acquisition is 2.20x EBITDA with the pension adding another 1.25x EBITDA. Free Cash Flow after the dividend allows NOC to continue retiring debt and pension contributions as well as repurchase some shares.

What is weak?

- **FAS/CAS pension income is about 10%-12% of income at NOC.** This is the difference between Service Cost for the pension calculated under GAAP vs. the amount billed in arrears to the government under Cost Accounting Standards. CAS exceeds FAS producing the income. **NOC is guiding to a reduction in this area largely due to changes in pension assumptions that will impact FAS in 2021. This may be a headwind of $0.71-$1.18 to EPS in 2021.**

- Pension funding needs could increase in 2021 and 2022 if the discount rate to calculate Pension Obligations falls in the annual results.

What to watch

- In 2Q20, the government questioned the discount rate assumptions to compute the CAS for the pension billing for years 2013-19. If FAS/CAS is 10%-12% of earnings and the CAS part declines as a result, it could lower EPS.

- NOC deals with long-term contracts and has to estimate where it stands on revenues earned and costs incurred at multiple points throughout the contract life. **This leads to changes in estimates and costs coming in above or below forecast. These changes are lumpy** and NOC does not remove them from an adjusted EPS. **The net has been favorable and adding about 10% to earnings also over time.** Changes to CAS may negatively impact this and there are risks at any time of other cost overruns.

- The one adjustment NOC makes to EPS is the Mark-to-Market of actual pension results. This is the gain or loss from changes to actuarial assumptions impacting PBO netted with the difference between actual returns on pension assets vs. the expected return of 8%. This very lumpy and does not represent cash earnings. However, it could create a smaller or wider pension underfunding level that needs to be addressed. This is only reported at year-end.

- Current tax law requires R&D to be capitalized and amortized over 5-years starting in 2022. NOC's EPS is helped by having R&D credits offset tax expense. The company estimates that if this law takes effect, 2022 could see a $1 billion increase in taxes – which is about $6.00 in EPS.

- A lack of share repurchases in 2020 could become a slight headwind for EPS growth of about 2% in the near future. The company intends to resume repurchases this year, but it is also possible pension funding could become a higher priority sooner too.

- Working capital looks fine even with COVID delay disruptions as the government is advancing payments to prime contractors like NOC to have them funnel it down to suppliers and subcontractors.

- Cash flow has headwinds in 2021 from repaying CARES Act payroll tax deferrals after the cash came in during 2020. NOC has $5 billion in cash on hand (perhaps $4 billion after retiring $1 billion in 4Q). We do not see other significant cash issues in the near term.

Supporting Detail

Pensions Are a Material Part of Earnings with Potential Risks that EPS Declines

There are more moving parts to NOC's pension than many other companies. Let's start with the basics:

- The pension plan is underfunded

- The 3Q20 balance sheet figure is an obligation of $6.4 billion which includes health care obligations. It is broken out in the 10-K but not the 10-Q - normally about 90% of the total is pension-related.

- Trailing 12-months EBITDA is $5.1 billion thus the pension only represents 1.25x EBITDA, with other net debt of $11.1 billion equal to 2.20x.

- Much of the underfunding is due to declining discount rates. Every 25bp decline in the discount rate adds $1.3 billion to pension obligations. In 2016, the discount rate was 4.19% and in 2019 it was 3.39%. It may well decline further in year-end results for 2020.

NOC does benefit from having government contracts. The contracts allow NOC to bill for changes in labor and labor-related costs which includes pensions. To the extent that past contracts were paid assuming higher discount rates and thus lower pension expense, NOC can now bill the government to deal with the reality that discount rates are much lower and those benefit obligations higher than expected. This is done under government Cost Accounting Standards or CAS. It is paid in arrears and comes to NOC as higher revenue.

- The company calculates pension expense the same way as other companies under Financial Accounting Standards (FAS).

- FAS shows primarily a service cost to reflect new benefits earned + an interest expense on the benefit obligation – an expected return on pension assets. That is a normal way for all companies with or without government contracts.

- NOC has to fund its pension under the rules of ERISA and make cash contributions when necessary. The falling discount rates for the last 12-15 years have boosted the PBO – Pension Benefit Obligation and NOC has been required to pay more into the plans to cover the increase in PBO.

It is important to keep in mind that both the CAS billing being received and the FAS expenses being recorded – are going through the income statement. The company essentially records this in operating income and shows a break-out of the two items. For the FAS expense, NOC is only using the service cost of new benefits earned:

	3Qs 20	3Qs 19	2019	2018	2017
CAS Received	$622	$622	$832	$1,017	$1,026
FAS Expensed	$306	$276	$367	$404	$388
FAS/CAS benefit	$316	$346	$465	$613	$638
Segment Op. Income	$3,047	$2,926	$3,909	$3,447	$2,903
Percentage	10%	12%	12%	18%	22%

- The CAS has exceeded FAS for some time and is generating over 10%-12% of operating income.

- CAS payment was sped up from a 15-year period to 10-years starting in 2013. The transition to the new rules occurred over 5-years and was fully in place by 2018. Thus, CAS was catching up and payments were heavier up until 2018.

- The CAS payments have dropped at this point and are contributing less income than in prior years.

- NOC is guiding toward higher FAS/CAS in 2020, but then a material decline in 2021 and 2022. From the 3Q20 conference call on 2020 guidance:

  > "*We've also increased our total net FAS/CAS pension adjustment by $25 million, in part to reflect the updated demographics study that we complete in the third quarter of each year.*"

  Also, with regard to likely changes in the discount rate and rate of return assumptions at the end of 2021 the company stated:

  > *"it could move FAS costs up, make it likely to lower our annual net FAS/CAS by $150-$250 million in both 2021 and 2022."*

- The government is questioning the assumptions that NOC is using to bill for CAS payments. This may represent a large risk for NOC earnings if a resolution leads to lower CAS payments in the future and potentially a large hit to cover several years of CAS payments already received. From the 10-Q:

  > *"The U.S. government has raised questions about an interest rate assumption used by the company to determine our CAS pension expense in previous years and in our current forward pricing rate proposal* ***<u>. On June 1, 2020, the government provided written notice that the assumptions the company used during the period 2013-2019 were potentially noncompliant with</u>***

CAS. *We are engaging with the government to address their questions. We submitted a formal response on July 31, 2020, which we believe demonstrates the appropriateness of the assumptions used.* ***However, the sensitivity to changes in interest rate assumptions makes it reasonably possible the outcome of this matter could have a material adverse effect on our financial position, results of operations and/or cash flows****, although we are not currently able to estimate a range of any potential loss. "*

Mark-to-Market and Non-Service Cost Issues with Pensions

Looking at NOC's Income Statement, it has two more items singled out relating to pensions below the operating income line. Here is the total pension expense for years 2017-19:

Pension Cost	2019	2018	2017
Service Cost	$367	$404	$388
Interest Cost	$1,360	$1,226	$1,250
Expected Return	-$2,101	-$2,217	-$1,885
Amortiz Prior Service Credit	-$59	-$58	-$57
Mark-to-Market	$1,783	$699	-$445
Other	$0	$0	-$7
Net Pension Cost	$1,350	$54	-$756

- The Service Cost is shown in the prior section as part of FAS/CAS and it is part of operating income.

- NOC takes the sum of the next three components of pension costs and records that below the operating income line as FAS (Non-Service) Pension Benefit. Essentially, the higher figure from expected return on plan assets makes this a source of earnings for NOC. The break-out is because the plan assets and interest costs are not assigned to the various operating segments like CAS billing and FAS service cost are.

- We do not have a problem with NOC breaking this benefit out separately. It does not impact earnings quality as NOC does not adjust this out or call it out as a one-time item in any way. That's a positive.

- This FAS (Non-Service) Pension Benefit item does bounce around based on changes to the assumptions for interest expense and expected rate of return:

FAS (non-Service)	2019	2018	2017
Interest Rate	4.31%	3.68%	4.16%
Interest Cost	$1,360	$1,226	$1,250
Expected Return	-$2,101	-$2,217	-$1,885
Amort. Prior Serv Credit	-$59	-$58	-$57
Total FAS (non-service)	-$800	-$1,049	-$699

- During these three years, the expected rate of return stayed at 8.0%. The benefit to earnings from the rest of it changed by $250-350 million based on movement in the interest rate assumption. When NOC noted in the 3Q call that it expects to see a $150-$250 million move in FAS/CAS based on interest rates and rates of return in 2021 and 2022 – we believe the discount rate change will impact CAS, but some of the total change will occur below the operating income line too in this area.

- **For a company earning $21-$22 per share – there is a potential headwind here of $0.71-$1.18 in this area of non-service-cost FAS.**

Mark-to-Market is a sizeable non-cash item and NOC does add it back to its adjusted earnings. This is shown below the operating income line in annual results.

- It represents changes in PBO- Projected Benefit Obligations as a result of changes to actuarial assumptions for discount rates and mortality.

- It also includes changes in plan assets based on the difference between actual returns and expected returns on assets during the year.

- Market-to-Market reports these changes for both the Pensions and the other Retirement Obligations – primarily health care and life insurance. So, the company's figures differ slightly from the pure pension figures shown in the first table in this section

Mark-to-Market	2019	2018	2017
Actuarial (loss)/gain PBO	-$4,866	$2,772	-$1,570
Actuarial (loss)/gain assets	$3,066	-$3,426	$2,119
Other	$0	-$1	-$13
Mark-to-Market	-$1,800	-$655	$536

- This is an area why we understand adjusting GAAP results for a more consistent measure of earnings. This is a very lumpy source of income or expense because the size of the Obligations and Assets is huge at over $30 billion. As noted earlier a 25bp change in the discount rate changes the obligation figure by $1.2-1.3 billion. Beating or missing the 8% expected rate of return on assets by 100bp helps or hurts the MTM by over $300 million.

- The adjustment to EPS is sizeable and very volatile too:

Earnings/EPS	2019	2018	2017
GAAP Net Income	$2,248	$3,229	$2,869
Mark-to-Market	$1,800	$655	-$536
MTM taxes	-$422	-$160	$132
Adjusted Net Income	$3,606	$3,724	$2,465
GAAP EPS	$13.22	$18.49	$16.34
MTM adjustment	$7.99	$2.84	-$2.30
Adjusted EPS	$21.21	$21.33	$14.04

NOC Made a Recent Acquisition – a Rare Event at NOC – with Conservative Accounting

In 2018, NOC bought Orbital ATK for $9.2 billion ($7.8 billion in cash and $1.4 billion of assumed debt). This was only 10.9x last year's EBITDA for the company. On top of that, this was the first acquisition since NOC bought TRW's defense business in 2002. So we do not consider NOC to be a serial acquirer and it would be tough to argue it overpaid.

The acquisition put $1.5 billion into intangible assets that will be amortized. We also like that NOC is amortizing these assets over less than 10-years. That compares to NOC's internal depreciation schedule of machinery and equipment had it built Orbital ATK in-house of "up to 20 years." Orbital's own depreciation schedule was 1-30 years. **The intangible asset total will be down to only $377 million by the end of 2022 as well** – so that again points to a conservative life estimate.

We also applaud that NOC does not add back the amortization expense of the Orbital deal as a non-cash expense to an adjusted EPS figure. The company does isolate from segment income to create an apples-to-apples comparison in discussing segment profits. But NOC's EPS is higher quality by not adjusting for amortization. **We will point out that is a tailwind for EPS growth as the rapid amortization lowers the expense going forward:**

	2023	2022	2021	2020	2019
Amortization of Purchased Intangibles	$78	$167	$204	$262	$332
EPS Impact	$0.37	$0.79	$0.97	$1.23	$1.54

We didn't do much with this except use the company's forecasts for amortization and actual figure for 2019. NOC had EPS of $21.21 in 2019 and $22.66 on a trailing 12-months. **The tailwind of 25-30 cents for EPS growth should continue.**

That only leaves goodwill. NOC boosted goodwill from the Orbital ATK deal by $6.26 billion. It is not amortizing that, which regular readers know we take an issue with. In this case, if NOC were amortizing goodwill over 40-years, it would be costing it 92-cents in EPS. Again, compared to trailing 12-months EPS of $22.66, that's only 4% of earnings. Also, the Orbital assets are producing strong EBITDA and free cash flow. That makes an impairment less likely in our view.

In the management discussion – NOC has an item called "unallocated corporate expense." This is primarily some of the amortization of intangibles and they marked up the value of some PP&E in the Orbital deal resulting in a stepped level of depreciation expense. **We do not see this as a negative issue. NOC does not add back the items to a non-GAAP earnings figure.** They give the reason as wanting to show an apples-to-apples segment profitability figure. Also, in this unallocated corporate expense line are things items that may not belong in any particular segment or cannot be billed to customers such as litigation costs, acquisition costs, advertising, or state tax impacts of pension items.

EAC – Net Estimated at Completion Adjustments Typically Add to EPS

Many of the contracts that NOC works on are multi-year in duration and the company must estimate the total costs over the length of the contract and then estimate how much of the total revenue has been earned and total costs expensed at various times and compare those results to the total deal. In any given quarter, there are outcomes that are favorable and unfavorable. This can include costs coming in above or below estimates or revenues being impacted by changes in assumptions.

The accounting procedure is what GAAP calls for and we believe NOC gives better disclosure into these items than most companies we have seen with a similar policy. In our experience, we have seen companies with long service contracts or leases underprice the deals to win the business by assuming very little actual service calls or a very high residual value. The company then reports strong earnings in the first few years and then calls the write-down of the residual value a one-time item or more than expected service calls just bad luck. We do not see evidence of that at NOC.

We expect adjustments to happen. However, we also are skeptical when a company reports that they have only seen favorable outcomes from adjustments. In NOC's case, they routinely report both favorable and unfavorable outcomes.

EAC - Estimate Adj.	3Q's 20	3Q's 19	2019	2018	2017
Favorable Adj.	$788	$803	$1,040	$1,019	$717
Unfavorable Adj.	-$429	-$382	-$560	-$442	-$357
Net of adjustments	$359	$421	$480	$577	$360
After Tax adjustments	$284	$333	$379	$456	$234
EPS Impact	$1.69	$1.96	$2.23	$2.61	$1.33

From a risk standpoint, these adjustments happen every quarter and often add about 10% to EPS. Being 10% or more of EPS makes them significant in our view and they are lumpy. It is not as if every quarter the adjustments are 50-cents per share +/- two cents. Here are the last 8-quarters:

EPS Impact of EAC	3Q	2Q	1Q	4Q
2020	$0.58	$0.53	$0.58	$0.27
2019	$0.58	$0.73	$0.64	$0.77

- 4Q is 4q19 and 4q18

To the extent changes in assumptions involving discount rates for CAS are in dispute for NOC and the government as noted above, that same problem may have an impact here depending on how that issue is resolved since CAS is added to the contract. Similar types of assumptions on different matters may be a risk too for EAC.

We don't see a problem with this accounting or the results. We just remind investors that this is a risk one has to be willing to accept with NOC. Plus, NOC has considerable experience in working with the US government on these types of contracts and has been doing this type of work for decades. This isn't a car company suddenly deciding to lease millions of consumer solar systems or a computer hardware giant switching its business into long-term service contracts out of the blue.

Working Capital During COVID

One issue that we know arose during 2020 was the government wanted to keep the defense industry moving. As a result, it opted to accelerate some payments to the primary contractors such as NOC. The idea was also that NOC would pay its own suppliers and subcontractors more quickly and ensure liquidity there. NOC made a similar comment on the 2Q20 call:

> *"**During the pandemic we're also especially closely monitoring the health of our supply chain, and we're accelerating certain payments** to help us continue to execute on commitments to our customers."*

Looking at four working capital accounts, there is some evidence of this process. However, in the larger picture, it does not appear any of the accounts are outside their normal levels. On the situation between NOC and its customer – we looked at DSOs for receivables, unbilled receivables, and advanced payment liabilities. For NOC's suppliers, we looked at DPOs for payables. The biggest moves happened in 2Q20 and seem to already be evening out:

	Dollar Terms				**DSOs/DPOs**			
	4Q	3Q	2Q	1Q	4Q	3Q	2Q	1Q
Accounts Receivable								
2020		$1,958	$1,989	$2,136		19.7	20.4	22.6
2019	$1,326	$2,111	$1,832	$2,166	13.9	22.7	19.8	24.1
2018	$1,448	$1,702	$1,815	$1,241	16.2	19.2	23.3	16.8
Unbilled Receivables								
2020		$5,723	$5,460	$5,918		57.5	56.1	62.7
2019	$5,334	$5,777	$5,657	$5,785	55.8	62.2	61.1	64.5
2018	$5,026	$5,600	$5,272	$3,869	56.2	63.2	67.6	52.4
Advance Payments								
2020		$2,235	$2,179	$2,027		28.2	28.2	26.8
2019	$2,237	$2,127	$1,942	$1,969	30.9	28.8	26.4	27.7
2018	$1,917	$1,686	$1,711	$1,479	27.0	25.2	28.1	26.1
Payables								
2020		$2,197	$2,006	$2,071		27.7	25.9	27.4
2019	$2,226	$2,021	$1,962	$1,932	30.7	27.3	26.6	27.2
2018	$2,182	$1,939	$1,824	$1,395	30.8	29.0	29.9	24.6

Sales have been growing about 5%-7% of late, which offsets some of the working capital growth if receivables build higher and advance payments drop a bit. Also, payables could rise from lower levels of DPOs and growth of sales boosting them further.

After 2Q, NOC guided to improvements in working capital. We think that happened in a couple of areas in 3Q. After 3Q, NOC still sees some room for improvement going forward but called it “a bit of tailwind” for working capital changes. Overall, we do not expect material moves in working capital unrelated to sales growth.

Share Repurchases Help EPS Growth – Which Slowed in 2020

Historically, NOC has repurchased shares as well as paid a growing dividend. These repurchases have helped EPS growth by about 3-4% in many years even though EPS has still been lumpy at times due to changes in many of the items we’ve discussed like CAS, EAC, etc.

	2020 YTD	2019	2018	2017	2016
EPS Growth	9.3%	-0.6%	51.9%	-5.9%	17.3%
EPS Growth w/o Repo	7.6%	-3.2%	51.0%	-8.4%	10.5%

The positive point is NOC can afford the repurchases:

	2020 YTD	2019	2018	2017	2016
Cash from Ops	$2,703	$4,297	$3,927	$2,613	$2,813
Capital Spending	$828	$1,264	$1,249	$928	$920
Free Cash Flow	$1,875	$3,033	$2,678	$1,685	$1,893
Dividend	$711	$880	$821	$689	$640
Repurchases	$490	$744	$1,263	$393	$1,547

The negative for the near future is share repurchases have been largely suspended. Of the $490 spent in 2020, only $11 million was in the 3Q and $131 million in the 2Q. That could lead to a 1%-3% headwind for EPS growth in 2021 and 2022. That may be short-lived as NOC is guiding that it will restart repurchases and it does have cash available. From the 3Q call:

> *“Regarding capital deployment, we continue to focus on a balanced strategy that calls for robust investment, strengthening of the balance sheet through debt reduction and funding of our pension plan and returning cash to shareholders, which we will do by resuming share repurchases and maintaining a competitive dividend. We believe our strong cash*

flow and current cash balances will allow us to address all of these value creating deployment opportunities."

Future Cash Flow Issues to Keep in Mind

- The CARES Act allowed NOC to boost cash flow by about $300-400 million in 2020 by deferring employee payroll taxes. That will need to be repaid in two installments in 2021 and 2022. This is the key reason 3Q guidance was for 2021 cash flow to be lower than 2020.

- The company believes it will grow in the coming years and higher income will produce cash flow. Plus, it sees the potential for working capital to be a small cash contributor.

- It seems likely that the discount rate on the pension may fall in calculating PBO at the end of 2020. That may increase the underfunded level for the pension – depending on if returns on bonds in the portfolio and the rally in the equity market since last May can offset that. Remember, NOC lowered its estimate for FAS/CAS in 2021 based on changing assumptions. If the pension underfunding level increased, NOC may need to devote more cash to the pension plans in 2021 and 2022 also.

- Without becoming a gold commercial – if all the COVID-related government borrowing does start to raise interest rates – NOC may be in a unique situation for a time. First, a 100 bp boost in rates would cut the PBO on the pensions by over $5 billion and reduce funding needs there and also reduce the debt/EBITDA ratio for NOC. At the same time, CAS is being paid in arrears, so those cash payments should continue for a time after rates increased – helping free cash flow further. NOC is not a serial acquirer and its debt maturities are well spread-out – so it does not have to access the debt market very often.

- The tax law is expected to cause R&D to be capitalized and amortized over 5-years starting in 2022. That would raise the effective tax-rate starting in 2022. Currently, R&D credits allow NOC to report a tax-rate below 21%. NOC estimates this would cost it about $1 billion in higher taxes in 2022 if the law remains the same. That would eventually normalize but could be costly upfront.

- Finally, NOC has laid out a plan to continue to grow the dividend and restart share repurchases as well as not hold $5 billion in cash. On the 3Q call it was noted:

- We've generated a healthy cash balance at this point with $5 billion at the end of Q3 that certainly enabled us to pay down the $1 billion of debt that we talked about earlier in October. We do continue to plan for a gradual deleveraging of the balance sheet.

- Our outlook [on CapEx] is unchanged, $1.35 billion this year and next with a gradual decline in terms of a percentage of sales thereafter.

- restarting our share repurchase program in 2021 and continuing to maintain a competitive dividend.

- Pension contributions are anticipated to pick up a bit in 2022.

ANSYS, Inc. (ANSS) Earnings Quality Review

6- Exceptionally Strong
5- Strong
4- Acceptable
3- Minor Concern
2- Weak
1- Strong Concern
+ quality improving
- quality deteriorating

We are initiating earnings quality coverage of ANSS with a 4+ (Acceptable) rating.

For an explanation of the EQ Review Rating scale, please refer to the end of this report.

Summary

ANSS is a leading provider of simulation software utilized by engineers working across virtually every major industry including aerospace, automotive, semiconductors, healthcare, and materials.

Like most large software companies, ANSS is seeing a shift to subscription-based services with components recognized over time and away from perpetual licenses with revenue recognized upfront. This has significant implications for the company's reported results, but overall, we do not have significant concerns with the quality of ANSS's accounting. However, we are more concerned with the company's accounting for its acquisition which we believe distorts the economic reality of the deals.

We do note that the company is seeing decline in annualized booking activity due to the impact of COVID and trade restriction with China. Also, investments in technology and marketing remain high which is resulting in the compression of EBIT. However, these trends are expected to reverse as conditions normalize.

What is weak?

- ANSS has made several acquisitions over the last few years. It has not taken on meaningful debt in the process. However, 75% of the purchase price of the most recent deals have been allocated to goodwill, and it is amortizing acquired technology over ten years which we believe is unrealistically long. However, the company adds back the amortization of acquired intangibles to non-GAAP results anyway. This completely ignores the cost of the deal even though management has noted before that it relies on acquisitions to drive innovation and the company would have to spend cash to develop these capabilities in-house.

- Stock compensation expense amounts to about 25% of non-GAAP operating income. This is not the largest figure we have seen among software companies but it is sizeable. Ignoring these amounts distorts the company's true earnings potential as the company would have to use cash to pay employees if it discontinued the stock-based programs. Also, it must spend cash to repurchase shares to avoid dilution.

- Accounts receivable DSOs have been rising as the company has extended payment terms for new customers and experienced payment delays in the COVID environment. Extending payment terms is not as large an inducement for large software contracts as it is for companies in other industries, so we are not overly concerned by an artificial boost to recent sales growth. We expect DSOs to come back down as we move through 2021.

What is strong?

- We note that unlike many software companies, ANSS does not consider sales commissions to be incremental costs to its contracts so it does not capitalize the costs to obtain its contracts.

What to watch

- Like most of the software industry, ANSS is seeing customers move to lease licenses with bundled maintenance and away from perpetual licenses with maintenance contracts purchased separately. With the advent of ASC 606 in 2018, the company is required to recognize not only revenue from perpetual licenses upfront but also the license portion of leases which has been determined to be 50% of the total contract value. (Maintenance is recognized over the contract term). This can lead to volatility in reported revenue with the timing of large deals.

- Deferred revenue days based on maintenance and service revenues increased YOY in the 9/20 quarter. However, it had been declinilng for several quarters before that. We believe this is likely due to differences in billing frequencies and time frames between separate maintenance contracts and maintenance bundled under lease contracts. We are not concerned at this point and will continue to monitor the trend going forward.

- The remaining performance obligation (RPO) is deferred revenue plus backlog and represents the total value of unbilled revenue from all existing contracts. Backlog has been growing faster than deferred revenue and now represents more than 60% of RPO, up from the mid-40% range two years ago. This is likely a reflection of the shift to longer-term enterprise deals with a smaller portion of the total contract value being billed early.

Supporting Detail

Overview of Revenue Recognition Policies and Trends

ANSS offers its customers the option to purchase both perpetual licenses which gives them the right an annually purchase maintenance, support, and upgrades, or to lease the product on a fixed-term basis which includes all support and upgrades. Revenue from perpetual licenses is recognized upfront. For lease license agreements, the company has determined that 50% of the contract value is a license and 50% is maintenance and support. The license portion is recognized upfront while the maintenance and support portion is recognized ratably over the lease term. Below we will examine the impact of the required switch to ASC 606 for revenue recognition in 2018, contracts trends, and trends in deferred revenue, remaining performance obligation (RPO), and annual contract value (ACV).

Accounting Change for Revenue Recognition and Contract Trends

In January of 2018, ANSS was required to adopt ASC 606 for revenue recognition. Before the mandatory adoption of the new standard, ANSS recognized revenue from perpetual licenses upfront but recognized the license portion of software leases ratably over the contract term. However, ASC 606 required the company to recognize the license portion of its lease revenue upfront. This is ironically a less conservative approach to revenue recognition than the company's existing method. It had the effect of both artificially boosting revenue growth in the first year of adoption as well as leading to increased volatility in the company's revenue growth trends.

On the subject of the volatility of revenue, it is important to note that the company is seeing a greater demand for large, enterprise deals which can magnify the volatility of reported revenue as large, multi-period deals signed in one period can result in the upfront recognition of the 50% license portion of lease deals. Also, the general trend in the industry has been away from perpetual license sales and towards subscription-based services. Consider the quote from the 12/19 10-K:

> *"We continue to experience increased interest by some of our larger customers in enterprise agreements that often include longer-term, time-based licenses involving a larger number of our software products. While these arrangements typically involve a higher overall transaction price, the upfront recognition of license revenue related to these larger, multi-year transactions can result in significantly higher lease license revenue volatility. As software products, across a large variety of applications and industries, become increasingly distributed in software-as-a-service, cloud and other subscription environments in which the licensing approach is time-based rather than perpetual, we are also experiencing a shifting preference from perpetual licenses to time-based licenses across a broader spectrum of our customers. This shifting preference was elevated in the first three quarters of 2020 as a result of the economic impacts of COVID-19, and we expect it to continue into the foreseeable future."*

Trends in Contract Type

The following table shows a breakout of revenue between perpetual licenses, lease licenses, and maintenance and support for the last eight quarters:

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Lease Licenses (Recognized upfront)	$78.917	$113.209	$44.874	$166.090
Perpetual Licenses (Recognized Upfront)	$62.705	$56.132	$42.956	$102.853
Software Licenses	$141.622	$169.341	$87.830	$268.943
Maintenance (Ratably)	$211.942	$203.179	$200.488	$200.806
Service (Ratably)	$13.401	$13.141	$16.667	$16.479
Maintenance and Service	$225.343	$216.320	$217.155	$217.285
Total Revenue	$366.965	$385.661	$304.985	$486.228

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Lease Licenses (Recognized upfront)	$70.693	$100.004	$69.256	$126.824
Perpetual Licenses (Recognized Upfront)	$66.451	$70.495	$53.788	$99.597
Software Licenses	$137.144	$170.499	$123.044	$226.421
Maintenance (Ratably)	$193.189	$185.118	$181.461	$175.921
Service (Ratably)	$13.566	$13.018	$12.625	$13.090
Maintenance and Service	$206.755	$198.136	$194.086	$189.011
Total Revenue	$343.899	$368.635	$317.130	$415.432

The shift away from perpetual licenses can be seen clearly in the YOY declines in perpetual license revenues, although the decline is also likely accelerated by the COVID environment and trade restrictions with China. At the same time, the license portion of lease agreements (which is recognized upfront) has increased the last two quarters which is consistent with the company's comment regarding the increased popularity of leases versus perpetual licenses.

Annual Contract Value (ACV)

Upon the adoption of ASC 606, ANSS began disclosing a metric it refers to as "Annual Contract Value" (ACV). At the introduction of the measure, management stated:

> *"To assist analysts and investors with their understanding of our operating results, we are introducing a new performance metric, Annual Contract Value (ACV). We believe this new measure is an improved metric as compared to the historically provided bookings metric because it adjusts the sales bookings metric to reflect only the annual value of a contract and also adjusts to reflect the sales booking at the date of the contract inception or renewal."*

ACV represents bookings made during the quarter with a current quarter start date that are annualized for license and maintenance contracts with a term greater than one year. This metric reduces the artificial benefit to bookings growth from a shift to longer-term contracts. The following table shows ACV for the last several quarters:

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Annual Contract Value	$305.334	$336.188	$301.050	$541.300
	5.0%	0.2%	-0.8%	12.7%

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Annual Contract Value	$290.856	$335.384	$303.490	$480.500

Note that recent ACV growth has benefitted from the 4/20 acquisition of Lumerical and the 11/19 acquisition of LST. Reported ACV growth for the nine months ended 9/20 was 3.3%, but this included an approximate 6% boost from acquisitions, so organic ACV growth is currently negative. This is due to COVID's impact on customers as well as trade restrictions with China negatively impacting growth. The company is projecting growth in ACV to return to the low teens as conditions normalize.

We also note the positive trend of recurring backlog rising to 77% in the quarter from the low 70% range a year ago, reflecting the shift to leases from perpetual licenses.

Deferred Revenue Trends

Deferred revenue represents amounts that have been billed or received before being recognized as revenue on the income statement. Since perpetual licenses revenue and the license revenue portion of lease revenue is recognized upfront, the bulk of deferred revenue is related to maintenance and service contracts linked to perpetual licenses and the maintenance and service portion of lease revenues. The following table shows the calculation of deferred revenue days utilizing maintenance and service revenues as the sales component in the formula.

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Maintenance and Service	$225.343	$216.320	$217.155	$217.285
Total Deferred Revenue	$338.432	$336.188	$365.751	$365.274
Deferred Revenue Days	138.2	141.4	153.3	154.7

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Maintenance and Service	$206.755	$198.136	$194.086	$189.011
Total Deferred Revenue	$303.315	$335.384	$344.276	$343.174
Deferred Revenue Days	135.0	154.0	159.6	167.0

	9/30/2018	6/30/2018	3/31/2018
Maintenance and Service	$180.315	$174.766	$172.827
Total Deferred Revenue	$286.453	$323.537	$329.394
Deferred Revenue Days	146.2	168.5	171.5

We can see that deferred revenue days based on maintenance and service revenue has been trending down YOY for the last several quarters before reversing in the 9/20 period. The decline in deferred days is puzzling on the surface as maintenance revenue is deferred regardless of whether it is recorded as part of a lease or purchased separately with a perpetual license. However, it is likely that payment frequency for maintenance contracts purchased with perpetual licenses have different billing frequencies than lease contracts with bundled maintenance and service. If less of the total contract is paid upfront under a lease agreement with bundled maintenance, then deferred revenue relative to maintenance sales could decline as maintenance sales shift to leases from separate contracts. We are therefore not overly concerned by the trend of declining deferred revenue days and view the YOY increase in deferred days in the 9/20 quarter as a positive.

Further reducing our concern with deferred revenue is the company’s reported backlog, which is the total unbilled portion of revenue expected to be generated by contracts currently in place. Backlog plus deferred revenue equals the remaining performance obligation (RPO) which is the total value of contracts that are in place but have yet to be recognized on the income statement. These RPO components are shown below for the last eight quarters as a percentage of total RPO:

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Backlog	$541.480	$510.282	$469.275	$505.469
% of RPO	62%	60%	56%	58%
Deferred Revenue	$338.432	$336.188	$365.751	$365.274
% of RPO	38%	40%	44%	42%
RPO	$879.912	$846.470	$835.026	$870.743

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Backlog	$347.072	$381.930	$328.372	$315.998
% of RPO	53%	53%	49%	48%
Deferred Revenue	$303.315	$335.384	$344.276	$343.174
% of RPO	47%	47%	51%	52%
RPO	$650.387	$717.314	$672.648	$659.172

	9/30/2018	6/30/2018	3/31/2018
Backlog	$258.262	$263.365	$265.615
% of RPO	47%	45%	45%
Deferred Revenue	$286.453	$323.537	$329.394
% of RPO	53%	55%	55%
RPO	$544.715	$586.902	$595.009

We can see that the company is reporting sustainable growth in its RPO which bodes well for future revenue recognition. However, backlog is becoming a larger percentage of the RPO which is a reflection of the increase in larger, longer-term deals. This may also indicate a shift towards less of the total contract value being paid upfront.

ANSS Relies on Acquisitions Yet Costs Are Ignored in Non-GAAP Adjustments

(Concern level: MEDIUM)

ANSS has made several acquisitions over the last few years which have added not only to growth but to the company's technological capabilities. The following table shows a schedule of deals done in the last three years:

Closing Date	Company	Price (millions)	Paid
4/1/2020	Lumerical	$107.500	Cash
11/1/2019	LST	$777.800	Cash (60%)/Stock (40%)
11/2/2019	Dynardo	*	
5/1/2019	DfR Solutions	*	
2/4/2019	Helic	*	
2/1/2019	Granta Design	$208.700	Cash
5/2/2018	OPTIS	$291.000	Cash

Dynardo, DfR, and Helic, collectively totaled $136.2 million

After the close of the 9/20 quarter, ANSS announced it is buying AGI for $700 million which will be funded with 67% cash and 33% stock, a similar split to the LST deal shown in the above table. ANSS expects to issue debt to fund the cash portion of the deal as it did with LST. The company's net debt has remained negative throughout the acquisition binge which is positive. As noted above, the company's recent ACV growth would have been negative had it not been for acquisitions, but this appears to be a temporary problem that should reverse after COVID. However, we do have some concerns regarding the company's accounting for acquisitions.

First, the company is utilizing what we consider to be very long estimated useful lives to amortize its acquired intangibles. The following table shows the allocation of the purchase price of the 2019 acquisitions among goodwill amortizable intangible assets:

		% of Price	Avg. Life
Purchase Price	$1,122.764		
Developed Software and Core Technologies	$225.163	20.1%	10 yrs.
Customer Lists	$61.659	5.5%	15 yrs.
Trade Names	$17.230	1.5%	10 yrs.
Goodwill	$841.771	75.0%	-

Approximately 75% of the purchase price was allocated to goodwill which will never show up as a cost on the income statement. Also, developed technology is being amortized over an average life span of ten years. Most software companies utilize a 3 to 5-year period and we see no compelling reason ANSS should be using double that. If the company amortized developed technology over 5 years, it would cost an additional 41 cps just for the 2019 acquisitions.

The useful lives used for amortization becomes irrelevant in practice as the company follows the typical tech company practice of adding back the amortization of acquired intangibles to its non-GAAP results. The following table shows amortization expense added back relative to adjusted operating income for the last eight quarters:

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Amortization of Intangible Assets from Acquisitions	$14.148	$13.927	$13.700	$11.500
Adjusted Operating Income	$146.863	$167.090	$90.573	$236.212

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Amortization of Intangible Assets from Acquisitions	$8.549	$8.551	$8.300	$7.000
Adjusted Operating Income	$149.722	$169.013	$137.186	$215.582

Amortization has grown to about 10% of adjusted operating income. This is not as high as some software companies we follow, but this is still a meaningful and growing cost that is being excluded from consideration by analysts only following non-GAAP figures. ANSS freely admitted in its 10-K that it relies on the technology picked up in these deals to enhance its product line:

> *"Our 2019 acquisitions, each a leader in their respective fields, are intended to bolster our strategy of Pervasive Engineering Simulation. The acquired technologies offer solutions that significantly enhance our portfolio, providing solutions valuable to our customers."*

ANSS spends over 20% of its revenue on R&D which is a reasonable figure in the software industry. However, if the company had developed these acquired technologies in-house, it would have incurred significant incremental R&D expenses that it would not have been able to simply write back into earnings. Therefore, we believe non-GAAP results distort the company's true earnings and this distortion will only grow if the company continues to acquire more companies in the future.

Stock-Based Compensation Is Rising and Added Back in Non-GAAP

The following table shows ANSS's stock-based compensation as a percentage of adjusted non-GAAP operating income:

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Stock-Based Compensation Expense	$38.185	$34.130	$30.900	$31.400
Adjusted Operating Income	$146.863	$167.090	$90.573	$236.212
	26.0%	20.4%	34.1%	13.3%

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Stock-Based Compensation Expense	$31.862	$29.122	$23.800	$24.500
Adjusted Operating Income	$149.722	$169.013	$137.186	$215.582
	21.3%	17.2%	17.3%	11.4%

While not the highest percentage of non-GAAP income we have seen, ANSS's stock compensation expense is still quite high relative to profits and it continues to rise. As regular readers know, we consider stock compensation to be a very real expense as if the company ended these awards without replacing them with cash considering, employees would likely leave. Therefore, we believe these costs should be considered when analyzing the company's true earnings potential.

Receivables Elevated Due to Collection Issues

The following table shows the calculation of accounts receivable DSOs for the last eight quarters:

	9/30/2020	6/30/2020	3/31/2020	12/31/2019
Revenue	$366.965	$385.661	$304.985	$486.228
Accounts Receivable	$371.352	$343.247	$337.105	$433.479
DSO	93.1	81.0	100.6	82.0

	9/30/2019	6/30/2019	3/31/2019	12/31/2018
Revenue	$343.899	$368.635	$317.130	$415.432
Accounts Receivable	$295.590	$297.798	$268.526	$317.700
DSO	79.1	73.5	76.2	70.4

The YOY increase in the 12/20 quarter was likely worsened by an acquisition. In addition, collections in subsequent quarters were impacted by COVID. Management stated in the Q3 conference call regarding cash flow:

> *"We have also factored into our outlook, the adverse impacts of customer payments that will be delayed into 2021, because of extended payment terms negotiated on new contracts and delayed payments on existing contracts. We're maintaining our estimate of these payments related negative impacts by 2020 operating cash flow to be in the range of $15 million to $25 million."*

For most industries, an increase in DSOs is a red flag as it indicates the extension of payment terms to pull sales into the current quarter at the expense of the next. While management did reference an extension of payment terms on new contracts, this is not as big a draw for customers for software companies. Therefore, we view this as more of a courtesy the company is extending in the COVID environment than a trick to boost sales in a current quarter. In our view, this makes the DSO increase less of a concern.

Explanation of EQ Rating Scale

6- (Exceptionally Strong)- Indicates uncommonly conservative accounting policies to the point that revenue and earnings are essentially understated relative to the company's peers. Higher possibility of reporting positive earnings surprises

5 (Strong)- Indicates the company has no areas of concern with its reported results and we see very little risk of the company disappointing due to recent results being overstated from aggressive reporting in recent periods.

4 (Acceptable)- Indicates the company may have exhibited a minor “red flag”, but the severity of the issue is not yet a concern. Minimal risk of an earnings disappointment resulting from previous earnings or cash flow overstatement

3 (Minor Concern)- Indicates the company has exhibited either a larger number of or more serious warning signs than companies receiving a 4. The likelihood of an immediate earnings or cash flow disappointment is not considered to be high, but the signs mentioned deserve a higher degree of attention in the future.

2 (Weak) Indicates the company’s recently reported results have benefitted materially from aggressive accounting. Follow up work should be performed to determine the nature and extent of the problem. There is a possibility that upcoming results could disappoint as the impact of unsustainable benefits disappears.

1 (Strong Concern)- Indicates that the company’s recent results are significantly overstated and that we view a disappointment in upcoming quarters is highly likely

In addition to the numerical rating, the EQ Review Rating also include either a minus or plus sign. A minus sign indicates that our analysis shows the overall earnings quality of the company has worsened since the last review and there is a possibility the numerical rating will fall should the problem continue into upcoming quarters. Likewise, a positive sign indicates that the overall earnings quality is improving, and the company may see an upgrade in its numerical rating should the trend continue.

Key Points to Understand About the EQ Score

The EQ Review Rating is much more than a blind, quantitative scoring method. While we utilize proprietary adjustments, ratios, and methods developed over decades of earnings quality analysis, the foundation of all of our analysis is reading recent SEC filings, press releases, conference call transcripts and in some cases, conversations with managements.

The EQ Review Rating is not comparable to a traditional buy/sell rating. The Rating is intended to specifically convey the extent to which reported earnings may be over/understated. Fundamental factors such as forecasts for future growth, increasing competition, and valuation are not reflected in the rating. Therefore, a high score does not in itself indicate a company is a buy but rather indicates that recent results are a good indication of the underlying earnings and cash generation capacity of the company. A low score (1-2) will likely result in us performing a more thorough review of fundamental factors to determine if the company warrants a full-blown sell recommendation.

Disclosure

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