

Software

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The Origin of Growth and a Better Crystal Ball

Key Message: This report attempts to help Software investors derive the New Business (normalized for duration) captured in a period. Notwithstanding the reference to the crystal ball in the title, there's no magic required here – just accounting, some math, and an understanding of the underlying business characteristics of the Software Model.

If recurring revenue is the lifeblood of a Software company, then new business is the nourishment that helps it grow and prosper. In addition, new business is the only unknown in forecasting revenue, so it is essentially the key variable in modeling the future revenue of a Software company. Both recurring *renewals* and *new* recurring revenue are important when assessing the underlying health, momentum, and ultimately, the potential value of a Software company.

In summary, *recurring revenue provides the overwhelming majority of the profit* of a Software company and allows it to persist, even through difficult times, once it attains a certain level of scale relative to its fixed cost basis; while *new business represents the future growth* of that recurring revenue and company profit, and *also provides higher confidence in the ability to predict future revenue*. Note that new business (either New ACV or New ARR) is a much more volatile metric than revenue, as should be expected.

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The Origin of Growth. We discuss the potential profit of recurring revenue in our Weekly, “What Price is Right?” but that doesn't account for any growth, which is driven by new business. New Business normalized for duration is expressed as New ACV (Annual Contract Value) or New ARR (Annualized Recurring Revenue), depending on the model employed and the “language” of the Software vendor. New ACV or New ARR contribute incremental recurring revenue, thereby adding to future revenue growth and profit.

A Better Crystal Ball. New ACV (or New ARR) is also the only unknown in forecasting future revenue of a Software company. Therefore, deriving historical values can help in more accurately modeling future revenue and future New Business (though New Business contributes very little to the revenue in the quarter it is captured).

Different Methods for Different Software Models; Also Dependent on Disclosure. We believe we can derive the New ACV (or New ARR) of a Software company regardless of the financial model it employs, including: Perpetual License + Maintenance, SaaS Subscription, On Premise Subscription, and Consumption models. The methodology used is also dependent on company disclosures. We detail each and provide examples herein.

Potential Inaccuracies. There are factors (such as early or late renewals, etc.) that can yield inaccurate estimates of New ACV that we discuss herein, but we believe the calculations are accurate, simply represented by accounting principles and math, which should spur conversation and questions for managements to address if in fact some of these factors arise.

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The Origin of Growth and a Better Crystal Ball

If recurring revenue is the lifeblood of a Software company, then new business is the nourishment that helps it grow and prosper. In addition, new business is the only unknown in forecasting revenue, so it is essentially the key variable in modelling the future revenue of a Software company. Both recurring *renewals* and *new* recurring revenue are important when assessing the underlying health, momentum, and ultimately, the potential value of a Software company.

In summary, *recurring revenue* provides the overwhelming majority of the profit of a Software company and allows it to persist, even through difficult times, once it attains a certain level of scale relative to its fixed cost basis; while *new business* represents the future growth of that recurring revenue and company profit, and also provides higher confidence in the ability to predict future revenue. A table of new business growth for our coverage universe is depicted in Exhibit 1. Note that new business (either New ACV or New ARR, both defined later in this report) is a much more volatile metric than revenue, as should be expected.

Exhibit 1: Software Business Momentum: Adjusted New ACV or New ARR

Adj New ACV or New ARR Growth	C2021	C4Q21	C1Q22	C2Q22
MSFT Azure	40%	27%	13%	11%
CRM	19%	9%	1%	(30%)
NOW	30%	14%	7%	(44%)
SMAR	58%	38%	2%	37%
WDAY	32%	10%	(16%)	(18%)
SNOW	75%	27%	41%	49%
SPLK	16%	5%	0%	(13%)
CRWD	46%	48%	34%	46%
PANW Subscription	29%	29%	28%	20%
OKTA	61%	82%	(15%)	(63%)
ZS	76%	55%	43%	44%
NET	58%	64%	54%	42%
Average	45%	34%	16%	7%
Average Security	54%	56%	29%	18%
Average Security, excl OKTA	52%	49%	40%	38%
Average Non-Security	39%	19%	7%	(1%)

Notes: New ACV/ARR Growth is calculated on an organic, constant currency basis

Excludes ORCL as we continue to assess the model

PANW calculations based on trailing-twelve months

Excludes PRGS as small adjusted New ARR levels skews our growth calculations

Source: Company Reports and Guggenheim Securities, LLC

Recurring Renewals = Potential Software Company Profit

Recurring revenue renewals provide the overwhelming majority of the profit of a Software company, if not more than 100% of the profit. This is because the greatest expense of almost any Software company in the world is Sales and Marketing, which is almost entirely used to capture new business. The reason for this is the “stickiness,” or recurring nature of Software revenue or sales, which is a result of several combined characteristics of the Software sector:

- *Software is largely sold to businesses.* There is a consumer software business, but Microsoft largely cornered that market in the 1980s and 1990s. In hindsight, they came to dominate it through use of monopoly power and they subsequently were reprimanded for this, but the market was changed forever. Other than Microsoft, there are a few other Software companies that sell to consumers, such as Intuit, a small part of Adobe, NortonLifeLock, and McAfee. Almost all other Software companies sell exclusively to businesses.
- *Software is sticky.* Once businesses purchase and implement software and it is helping them run their businesses, they tend to keep using (and paying for) it. Businesses are not like fickle consumers. The recurring cost of the software (subscription or maintenance fees) become a cost of doing business. In addition, there are usually significant switching costs that include perhaps a new upfront license fee, implementation fees, and not to be forgotten, new fees to train users of the Software.
- *Therefore, Software companies do not have to pay sales commissions on Software renewals; they only pay them on the capture of new business.*
- *Sales & Marketing is the highest expense for almost any Software company in the world.*
- *Software Companies often sell new business at a loss because **the renewals are so profitable**, and they make up the loss in a matter of just a few years and then it's all profit thereafter.* There is some expense in collecting renewals, but it's minor, and the largest expense of a software company (Sales and Marketing) is essentially eliminated for the renewals part of the business.

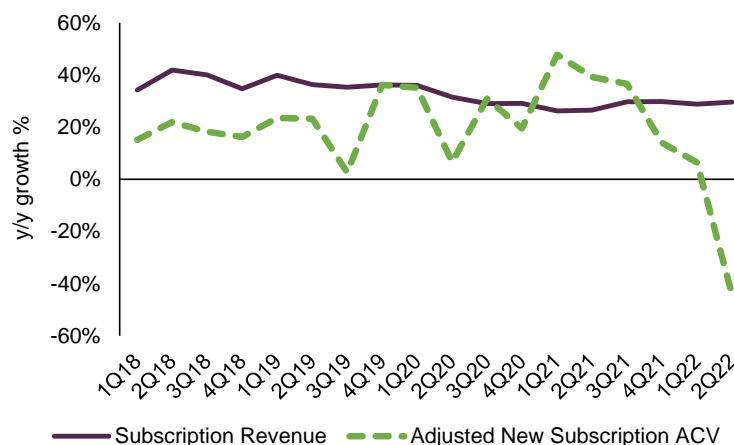
Some final thoughts on this topic: Sometimes even Software companies with a significant renewal base still produce negative profit margins (whether GAAP, non-GAAP, or free cash flow). This usually isn't because their renewal base is less profitable than the typical software company (though that can play a role) but is usually because management has decided that there is a significant opportunity to capture new business (that afterwards is very sticky – and profitable). For instance, if there's a meaningful greenfield opportunity to capture new business in a new emerging software category, then it's logical to us that such a company would operate at negative margins for longer than it would otherwise. Again, once this customer base is captured, it's likely to remain a profitable customer thereafter, even though it's captured at a loss. Some of the new data technology companies likely fall into this category, along with some applications, such as sales execution, customer engagement, and experience management.

New Business = Both Revenue & Potential Profit Growth

New business adds to the recurring revenue base, increasing a company's scale (i.e., growth) and profit over time, while also providing the most important business driver for forecasting. There are several reasons why new business should be assessed and analyzed when a company reports new information (e.g., on earnings reports):

- *It is paramount in gauging the underlying momentum of the Software company and can indicate an inflection point (in either direction) in the business.* It may also not be any more than a bump in the road or a temporary boost in business, but we should still understand it since it could be something more relevant as it pertains to the longer-term business trend.

- *New business is even more important to young companies* trying to attain the scale of recurring revenue required to sustain the company in tough times, *but it's also important to established companies* to increase their future potential cash flow (and hence, valuation).
- *New business also provides good visibility into future revenue*, thereby offering a valuable predictive characteristic, especially as it ultimately relates to future growth and profit of a company and valuation of a stock. At the same time, renewals are formulaic and non-recurring revenue follows typical ratios dependent on New Business. Therefore, ***New Business is the one unknown variable that drives the top line forecasts for all our models.*** We detail this later in this report.
- *Finally, an anecdote:* When we started covering the Software sector in 1999, the metric investors most focused on by far was perpetual license revenue, which was a very volatile metric. Perpetual license was by definition, the new business sold in a period and the growth of new business was an indication of the momentum of that business. Since Software was a growth sector, this made sense. However, the volatility of this metric led to volatility of the underlying stocks. Was acceleration or deceleration (or even a decline) of license growth an indication of an inflection point in the business, or was it simply a bump in the road along an otherwise steady trend (in either direction)? ***The industry transition to subscription models served to smooth this revenue volatility, but it did not smooth the underlying business volatility.*** As an example, we show the contrast between the relatively smooth subscription revenue growth and the volatile Adjusted New ACV growth (which we calculate as a proxy for new business) of ServiceNow. See Exhibit 2.
- In summary, while we continue to view the Software sector as the best business model we know of, we believe it is important to understand this volatility (and frankly, it's our job) to identify potential inflection points in the business, or simply to serve as an impetus to questions that may have logical answers (or not).

Exhibit 2: ServiceNow Subscription Revenue Growth vs. Adjusted New ACV Growth

Note: ACV is adjusted for foreign exchange impact, effects of fluctuation in billing duration, and early renewals (affecting F2Q20, F3Q20, F4Q20, F1Q21, and F2Q21); Adjusted New Subscription ACV y/y growth rate is calculated off prior year's unadjusted ACV; Subscription Revenue y/y growth rate is on constant currency basis

Source: ServiceNow, Guggenheim Securities, LLC estimates

Validation of the Significance of New Business

We believe that New Business signed in a period normalized for time (i.e., annualized) is an accurate measure of business momentum and significantly assists companies and investors as the only true unknown in forecasting revenue. New business is expressed as either New ACV or New ARR, depending upon the “language” of each specific company. In other words, some companies simply talk about ACV and some about ARR. Furthermore, the relevance of New ACV or New ARR is validated by the actions of vendors, such as:

- New ACV or New ARR is usually the most relevant metric used to measure the efficiency of a sales force by company managements. Frankly, it's how they run, or rather drive their businesses. Revenue is not the metric used internally like it often is in the investment community, where revenue is readily available and New ACV or New ARR is less certain.
- This is further supported by New ACV or New ARR being the primary metric used to pay sales commissions.

Nomenclatures When Defining New Business

Before we explain how to model the various types of recurring revenue, we need to define the terms typically used in the industry for identifying recurring revenue and new business:

Recurring Revenue

There are several revenue categories that are recurring in nature, and hence, should be included in an assessment of Recurring Revenue:

Perpetual Maintenance

Perpetual Maintenance is the recurring portion of what is today considered the “legacy” Perpetual License plus Maintenance software model. In this model, the customer purchases a license to use a certain capacity of the software forever or perpetually (hence, the name). The customer does not own the software per se but owns the right to use a certain capacity. In addition, the customer can choose to also purchase an annual maintenance fee that gives the customer the right to security patches, bug fixes, helpdesk support when needed, and enhancements to the software when released as part of the product. Some software companies offer different levels of maintenance and support, and some split maintenance and support fees, but for our purposes we’ll assume they’re all one fee. A rule of thumb is that annual maintenance fees are 20% of the upfront license fees (and there often are COLA annual increases in price) and maintenance revenue is recognized ratably over the duration of the contract. Although perpetual maintenance is optional, most customers purchase it as long as they’re using the software to help run their business given the importance of its content (security, bug fixes, updates, etc.).

SaaS Subscription

SaaS (Software-as-a-Service) is the recurring revenue of a SaaS solution. The customer pays the subscription in order to access the service through the Internet. The subscription price is typically based on capacity, either seats, workloads, data processed, or some other measure. In previous work, we have seen examples of vendors that provided both Perpetual License and SaaS offerings for similar products and have found the SaaS offerings to be at least 2.5x the equivalent perpetual maintenance pricing, but we have seen higher multiples. On the other end of the spectrum, we’ve seen ratios closer to 1:1 when a vendor is aggressively encouraging its customer base to transition to Cloud. As in perpetual maintenance, SaaS subscription revenue is recognized ratably over the duration of the contract. The software is hosted by the software vendor or its proxy (e.g., AWS). The customer only has access as long as the subscription fee is paid.

Consumption Models

Consumption models provide a slight twist in the SaaS Subscription model. In this model, the customer only pays for how much use of the SaaS solution is consumed, whether it’s workloads processed, data processed, etc. (you only pay for the use of the SaaS solution when it is actually being used). This model has become more popular recently with high growth names like Datadog and Snowflake. While we agree there are certain positive attributes to this model, including contracts that present less friction for growth, we’d caution that just the opposite is true too. There’s less friction for paring back use, which was exhibited for these names at the beginning of pandemic when uncertainty was widespread. Consumption model pricing is also based on capacity (workloads, data processed, etc.) and the amount of revenue recognized in a period is typically based on how much of that capacity is consumed during the period. Consumption models are usually applied to SaaS infrastructure today (IaaS or PaaS), but it is possible that it can be applied to SaaS applications in the form of hours of access to the SaaS solution.

Term Subscription = Term License + Term Maintenance

On-premise Subscription (vs. SaaS subscription, which is Internet, or Cloud based) is subscription paid for software that is utilized in a customer’s datacenter, or may be hosted by someone else (e.g., in a Public Cloud) for use by the customer. Investors should think of this as a true lease model, where the customer gets all the benefits of perpetual maintenance but does not own the Perpetual license right to use the software forever. Use of the software is dependent on the payment of the subscription fee and is contractually

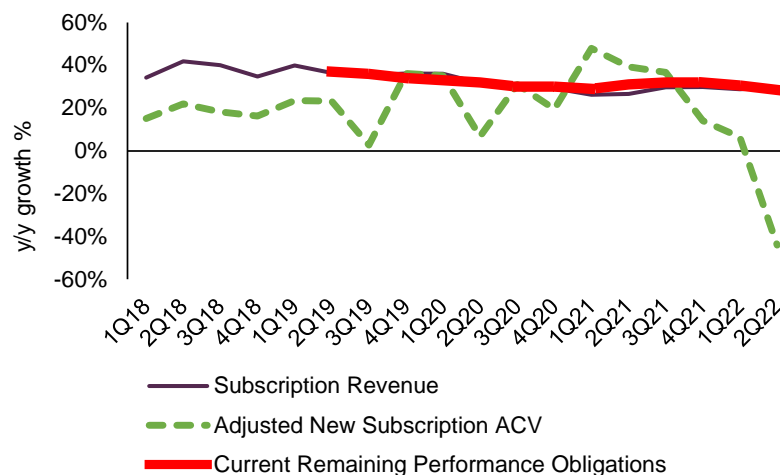
permitted only during the term of the subscription. Pricing is based on capacity, similar to the Perpetual and SaaS models, where actual price/capacity would likely be somewhere between perpetual maintenance (since there's no perpetual license fee with term subscription) and SaaS subscription (where the vendor provides that infrastructure to run the software). Revenue recognition used to be relatively simple, and similar to the ratable recognition of perpetual maintenance and SaaS subscription, but **ASC 606 added significant complexity, becoming the bane of investors and vendors alike**. ASC 606 requires an upfront term license recognition that reflects the allocated standalone selling price for use of the Software IP (which in theory should approximate the intrinsic value) and term maintenance that is recognized ratably.

- **Term License** – is the portion of term subscription that is recognized upfront at the beginning of a contract. Unlike perpetual license, term license is recurring, but it only recurs upon the renewal of a contract. Therefore, when normalizing for time, this metric has to be divided by duration and modelled as if it was ratable to accurately account for term license recognized previously. We'll detail this later in this report.
- **Term Maintenance** – is recognized ratably over the duration of the term subscription contract. It is usually calculated as an annual percentage of the term license; however, we have seen instances where it is a fixed percentage of the term license regardless of the duration. This is an example of ASC 606 providing vague guidance with no precedent, which led to each company setting its own precedent, which it has to continue to follow, often to its detriment and the detriment of investors (e.g., Splunk).

Other Balance Sheet Complications of ASC 606 Term License

The treatment of on-premise subscription by ASC 606 also results in other balance sheet complications since vendor billing does not align with the timing of revenue recognition. We mention Unbilled Receivables here for completeness, but note that it typically will have very little effect on our calculation of New ACV, though it can for a company that has a material amount of on-premise SaaS subscription, usually from legacy contracts or sometimes Federal Government arrangements. For instance, if a vendor signs a three-year term subscription contract, they may bill the customer in three equal annual invoices starting at the beginning of the contract. However, the upfront term license may account for more revenue than is billed in the first period or year. This results in an Unbilled Receivable asset on the balance sheet. Unfortunately, most Software vendors are likely including this in catchall lines, such as "Prepaid Expenses and Contract Assets," and not identifying this as a separate line item, nor even identifying its value in notes, as it is probably "immaterial."

For some companies, like ServiceNow and Okta (both appear to have some minimal on-premise deployments), they have disclosed Unbilled Receivables during times when they have encouraged investors to consider some measure of billings as a gauge of their businesses. However, ServiceNow ceased the practice in 2022 and Okta will cease it in 2023 (FY24), as they both now steer investors to RPO metrics as measures of their business. We'll leave further discussion on RPO to a subsequent report, other than to say here that it provides essentially no value in gauging the momentum of the business in the quarter, and that New ACV calculations do. See Exhibit 3 for a comparison of the growth in revenue, cRPO, and New ACV of ServiceNow. We will estimate Unbilled Receivables going forward on these companies, but believe the effect is immaterial for both in most periods, though we know of one period (3Q21), when it was material for ServiceNow.

Exhibit 3: ServiceNow Growth in Revenue, cRPO, and New ACV

Note: ACV is adjusted for foreign exchange impact, effects of fluctuation in billing duration, and early renewals (affecting F2Q20, F3Q20, F4Q20, F1Q21, and F2Q21); Adjusted New Subscription ACV y/y growth rate is calculated off prior year's unadjusted ACV; Subscription Revenue and Current Remaining Performance Obligations y/y growth rate are on constant currency basis; 2Q22 cRPO growth adjusted by 1.5% due to timing headwind from larger-than-average renewal cohort

Source: ServiceNow, Guggenheim Securities, LLC estimates

Recurring Revenue Normalized for Time: ACV and ARR

Normalizing recurring revenue per time (i.e., annualizing it) can help us better understand the health and momentum of a Software company, while also helping to predict future revenue. We discuss the terms ACV (Annual Contract Value) and ARR (Annualized Recurring Revenue) in this section. They are defined similarly, yet are slightly different, but for our purposes, we can think of them as essentially the same: the new business signed in the period normalized for time (one year).

ACV (Annual Contract Value)

Annual Contract Value (ACV) is the value of a contract normalized for contract duration (D) by dividing by the length of contract in years. So for a 3 year contract worth \$4.5 million in Total Contract Value (TCV):

$$\text{ACV} = \text{TCV}/\text{D} = \$4.5\text{M}/3 \text{ years} = \$1.5\text{M}/\text{year}$$

Similarly, for a monthly contract at \$5,000/month:

$$\text{ACV} = \$5,000/(1/12) \text{ years} = \$60,000/\text{year}$$

New ACV

New ACV is simply the ACV signed in the period excluding any renewal ACV. This can also be expressed as the Total ACV in the period minus the Total ACV in the year ago period (4 quarters ago) multiplied by an annual gross renewal or retention rate (R). For the example where Total ACV of the current period is \$100 versus Total ACV in the year ago period of \$90 and the gross renewal rate is 90%:

$$\text{New ACV}_0 = \text{Total ACV}_0 - \text{Renewal ACV}_0$$

$$\text{New ACV}_0 = \text{Total ACV}_0 - \text{Total ACV}_{-4} \times R$$

$$\text{New ACV} = \$100 - \$90 \times 90\% = \$100 - \$81 = \$19$$

ARR (Annualized Recurring Revenue)

Annualized Recurring Revenue (ARR) is similar to ACV and frankly, can usually be thought of as the same thing. **By definition, ARR represents the recurring revenue at the end of a period if it were annualized.** For instance, all of the recurring revenue categories discussed above would have to be annualized. A rough estimate would be to multiply perpetual maintenance, SaaS subscription, and term maintenance recognized in quarterly results by four and then add that to term license divided by the average term, but you'd also have to add portions of previous term license to fully annualize this. This would only represent the average ARR in a period. If the company is growing, actual ARR at the end of the quarter would be greater than this (and if the company is declining, ending ARR would be less than average ARR). Luckily, some companies disclose ending ARR in quarterly results, but even for those that don't, we have ways to more accurately estimate future revenue than by using average ARR, which we outline below.

New ARR

Similarly, New ARR can be thought of as equivalent to New ACV. It can be derived as the Total ARR of a period minus the Renewal ARR, which is the Total ARR from the prior period (not the year ago period, unless you're measuring New ARR for a year) multiplied by the gross renewal rate adjusted for that period. For instance, if a gross annual renewal rate is known, the equivalent gross quarterly renewal rate can be estimated and New ARR can be calculated as follows:

$$\text{New ARR}_0 = \text{Total ARR}_0 - \text{Renewal ARR}_0$$

$$\text{New ARR}_0 = \text{Total ARR}_0 - \text{Total ARR}_{-1} \times R_Q$$

$$\text{where: } R_Q = R_A^{(1/4)}$$

$$\text{New ARR}_0 = \text{Total ARR}_0 - \text{Total ARR}_{-1} \times R_A^{(1/4)}$$

Calculating New ACV/ARR and Modelling Future Revenue

There are 3 or 4 basic Software revenue models and each may have more than one way to build them depending upon what information is disclosed by the company:

- 1) Perpetual License + Maintenance
- 2) SaaS Subscription
- 3) On-Premise Subscription
- 4) Consumption Model (but this really follows the SaaS model so far)

Note that we focus on Software revenue in the discussion that follows, as Professional Services are often a loss leader or breakeven business that's main purpose is to ensure the implementation and utilization of the Software. Even if Pro Services are profitable, they're not nearly as profitable as Software revenue. For completeness, we typically model Professional Services as a percentage of New Business in a quarter, or sometimes total Software business.

1) Perpetual License + Maintenance

We'd be hard-pressed to think of any pure examples of this model remaining, but portions of the businesses of SPLK, ORCL, MSFT, SAP, etc., still employ it for existing customers, even if they don't sell any new license in some cases. This is the traditional (legacy) model pioneered by the Software industry. It remains (partially) in effect for several vendors, but newer companies have chosen not to employ this model. An example of such a model can be found in the link [Perpetual License + Maintenance Model](#).

- a) Contract Terms:** The customer owns the right to use the capacity (seats or some other measure) purchased of the software perpetually (i.e., forever) – hence the name of the model. The customer also has the ability/choice to purchase annual maintenance in order to receive bug fixes, security patches, and technology improvements over time. The maintenance is optional, but most customers purchase it because of its importance and as sort of an insurance policy.
- b) Modelling:**
- **License** is driven by several factors including sales capacity, macro forces and other demand variables to derive a year-over-year growth rate. While we may look at sales capacity and derived metrics from time to time, we've found that using sales capacity to forecast future revenue always eventually (and unexpectedly) breaks.
 - **Maintenance** is formulaic and is driven by the % of license revenue that maintenance is and how back-end quarters typically are for a company.
 - Let L_0 = License Revenue in present Q
 - Let M_0 = Maintenance Revenue in present Q
 - Let $M\%$ = Annual Maintenance as % of License. This is usually 20%, but it can vary depending on several inputs, including whether it's based on the license list price or market price (since license is often discounted).
 - R = Annual Renewal Rate of Maintenance. Typically at or above 90% for Enterprise vendors and at or above 80% for vendors catering exclusively to SMBs.
 - $P\%$ = weighted average % of the quarter left upon booking contracts. Since many (but not all) contracts are sold near the end of the quarter, it's often assumed that about 2 weeks (or $1/6 \sim 17\%$) of a quarter's revenue is recognized, on average.
 - The formula based on these variables:

$$M_0 = M_{-4} \times R + (L_0 \times P\% + L_{-1} + L_{-2} + L_{-3} + L_{-4} \times (1 - P\%)) \times M\%/4$$

- If we assume typical variables as described above:

$$M_0 = M_{-4} \times 92\% + (L_0 \times 17\% + L_{-1} + L_{-2} + L_{-3} + L_{-4} \times (1 - 17\%)) \times 20\%/4$$

c) New Business:

License growth is usually an accurate measure of new business growth.

License + first year of maintenance is the actual new business, but license growth yields the same percentage growth result since maintenance is a consistent percentage of license.

We say “usually” because sometimes license is sold, but not recognized for several possible reasons related to the terms of the contract (e.g., the product is not yet “Generally Available”). In such cases, the license growth in the quarter it is recognized is artificially inflated but was suppressed in the (prior) quarter it was sold.

2) SaaS Subscription

SaaS subscription is a true service model in that the customer is given access to the technology through the Cloud and consumes it as a service.

- a) Contract Terms:** This should be considered as a true lease model. The customer does not own anything but the right to use the SaaS service only if he pays the Subscription fee. Subscription fees are often paid annually but can be paid monthly (sometimes in arrears) or for any period for that matter. If the fee is not paid, customer access to the service can be removed.

There are a few ways to model this depending on whether the vendor discloses **ARR (Annualized Recurring Revenue)** or not:

A) Vendor Does Not Disclose ARR, But Bills Annually

We use this model when the vendor typically bills annually, or the mixture of billings (e.g., annual, monthly, biannual, quarterly, multi-year) is relatively consistent from quarter to quarter. Examples are: CRM, WDAY, NOW, ZS, OKTA, and SMAR. An example of such a model can be found in the link [SaaS Model When Vendor Does Not Disclose ARR, but Bills Annually](#).

- b) Modelling:** We can model revenue for such a company by using the concepts of Annual Contract Value (ACV) and New ACV.
- We can model the total Annual Contract Value of a quarter as the Subscription Revenue + the sequential change in Current Deferred Revenue.
 - i. Let $Subs_0$ = Subscription Revenue in Current Q
 - ii. Let $STDR_0$ = Short Term (or Current) Deferred Rev in Current Q
 - iii. Total ACV = $Subs_0 + STDR_0 - STDR_{-1}$
 - Renewal ACV = ACV from a year ago x an annual renewal rate, where:
 - i. R_0 = Annual Renewal Rate of ACV $_{-4}$ in current Q
 - ii. Renewal ACV $_0$ = Total ACV $_{-4}$ x R_0
 - iii. Renewal ACV $_0$ = $(Subs_{-4} + STDR_{-4} - STDR_{-5}) \times R_0$

- Therefore:

$$\text{New ACV}_0 = \text{Total ACV}_0 - \text{Renewal ACV}_0$$

$$\text{New ACV}_0 = (\text{Subs}_0 + \text{STDR}_0 - \text{STDR}_{-1}) - (\text{Subs}_{-4} + \text{STDR}_{-4} - \text{STDR}_{-5}) \times R_0$$

- Revenue can be modelled using the method, Total ACV is spread out over the ensuing 4 quarters (or 5 quarters assuming the weighted average deal signings were at some point in the current quarter, most likely near the end given the backend loaded nature of the enterprise software business). Then the columns for revenue are summed to yield subscription revenue for that particular quarter.
 - This can alternatively be done with two waterfalls – one for New ACV and one for Renewals ACV. We prefer this method because it gives you the percentage of revenue that comes from New business and that from Renewals, enabling a gauge on risk.
- c) **New Business** is calculated as above. New business growth is just the year-over-year growth of New business but be careful to compare unadjusted New Business from a year ago to adjusted New Business for the current quarter (i.e., adjusted for FX, acquisitions, renewal billings shifts, etc.) where appropriate.
- Not to complicate things, but there are some adjustments that should be compared to similarly adjusted numbers from the previous year, such as adjustments for upfront license revenue from Tableau and MuleSoft on-premise sales (per ASC 606) in the case of Salesforce.
- d) **Caveats:**
- **Unbilled Receivables.** ASC 606 introduced this new balance sheet item, which arises when revenue is recognized before cash is collected for that part of the contract. This happens with on-premise subscription due to the upfront term license recognition, but we're not calculating billings in determining business momentum for such models. Where it does affect our modelling is for ramped deals for SaaS Subscription models. For instance, consider a SaaS Subscription contract where the first year of a three-year contract rolls out the product (for instance Human Resources software) for one third of the customers workforce for \$1 million, the second year rolls out another third and totals \$2 million, and the third year rolls out the final third for a total of \$3 million. ASC 606 dictates the recognition of \$2 million subscription per year over the three years of the contract. In this case, the first year will recognize an extra \$1 million, which is an increase of unbilled receivables by that amount. This goes to zero after the third year, but it can skew results of some companies. Therefore, when calculating Current Billings, the formula should be modified to subtract the sequential change in Current or Short-Term Unbilled Receivables (STUR). Note that ramped deals are not the norm, but they're not rare either.

$$\text{New ACV}_0 = \text{Total ACV}_0 - \text{Renewal ACV}_0$$

$$\text{New ACV}_0 = \text{Subs}_0 + (\text{STDR}_0 - \text{STDR}_{-1}) - (\text{STUR}_0 - \text{STUR}_{-1}) - ((\text{Subs}_{-4} + (\text{STDR}_{-4} - \text{STDR}_{-5}) - (\text{STUR}_{-4} - \text{STUR}_{-5})) \times R_0)$$

- **Change in Deferred Revenue on the Cash Flow Statement.** Some companies recommend that investors use the Change in Deferred Revenue on the Cash Flow Statement as it (sort of) takes account of the foreign exchange effects on Deferred Revenue reflected on the Balance Sheet. First of all, the change in deferred revenue on the Cash Flow Statement can be affected by other factors that might muddy our calculations, though it will not report any change in deferred revenue acquired upon an acquisition (which we would otherwise have to back out). In addition, this is change in total deferred revenue, which will introduce inaccuracies in our calculation unless there is little or no Long Term Deferred Revenue (as in the case for CRM). Regardless, this can be rectified by still using the Current Deferred Revenue on the Balance Sheet and adjusting for the sequential and year-over-year effects of foreign exchange translation on these numbers, which is our preferred method at this time (but we do see why some would rather use the cash flow statement).

B) Vendor Does Disclose ARR

Few companies that employ a SaaS subscription model disclose ARR on a regular basis, but some do. Examples are: CRWD, S, and the Cloud business of SPLK. An example of such a model can be found in the link [SaaS Model When Vendor Discloses ARR](#).

- b) Modelling:** Again, we will assume that the vendor bills annually, or that the mixture of billings (e.g., annual, monthly, biannual, quarterly, multi-year) is the same from quarter to quarter. This is actually easier to model, as it does not require a waterfall model.
- **Annualized Recurring Revenue** is usually defined as the culmination of annualized revenue contracts in place at the end of a period (e.g., quarter). We can model subscription revenue from ARR.
 - i. The majority of subscription revenue in a quarter is the ARR of the previous quarter x the quarterly renewal rate [= annual renewal rate ^{^(1/4)}] divided by 4 (since ARR is an annualized number and we want quarterly revenue).
 - ii. Given the usually backend loaded nature of enterprise software sales in any given period, there is a much more minor portion of subscription revenue that comes from new ARR contracts sold in the quarter.
 - iii. New ARR is typically the foundational driver of this model given the consistency of the renewal rate in the enterprise software model. New ARR is predicted based on previous New ARR growth and other macro factors.
 - iv. The analyst should take a portion of the New ARR/4 to get the incremental subscription revenue from New ARR signed in the

quarter. From experience, this is usually anywhere from 17% to 50%.

- Let QR = Quarterly Renewal Rate
- If Annual Renewal Rate = 95%, the QR = $95\%^{(1/4)} = 98.7\%$
- Let P = % Revenue in Q from New ARR
- The formula for Subscription Revenue is:

$$\text{Subscription}_0 = \text{ARR}_{-1/4} \times \text{QR} + \text{New ARR}_{0/4} \times P$$

- If we assume typical variable values as described above:

$$\text{Subscription}_0 = \text{ARR}_{-1/4} \times 98.7\% + \text{New ARR}_{0/4} \times 17\%$$

c) New Business is New ARR

$$\text{New ARR}_0 = \text{ARR}_0 - (\text{ARR}_{-1} \times \text{QR})$$

Assuming typical variables above:

$$\text{New ARR}_0 = \text{ARR}_0 - (\text{ARR}_{-1} \times 98.7\%)$$

C) Vendor Does Not Disclose ARR, and Billings Mix Varies

Sometimes a vendor has a varying mix of billings durations (e.g., monthly, quarterly, bi-annual, annual), so New ACV doesn't work either (Examples are DDOG, SNOW, ZEN, etc.). An example of such a model can be found in the link [SaaS Estimated Ending ARR Model](#).

b) Modelling:

- The average ARR is taken for the current quarter and all historical quarters:

$$\text{Avg ARR}_0 = \text{Revenue}_0 \times 4$$

- Assume that the ARR at the end of a quarter is the average of the Avg ARR in the current quarter and the Avg ARR in the subsequent quarter. Rather than equal weighting these quarters, Ending ARR can also be weighted to one quarter or the other depending on knowledge of linearity in the quarter.

$$\text{Ending ARR}_0 = (\text{Avg ARR}_0 + \text{Avg ARR}_1)/2$$

- We can then measure the percentage difference between the Avg ARR in a quarter and our calculated Ending ARR in the same quarter ($\% \text{Diff}_{\text{Hist},0}$), which usually results in seasonal patterns (e.g., the difference may be 4-5% for the first two quarters and about 6% for the third quarter and about 8% for the fourth quarter). This is only needed for the just reported quarter.
- Based on these historical patterns, we can assume similar differences in the just reported quarter to estimate Ending ARR for the just reported quarter only.

For just reported Q:

$$\text{Ending ARR}_0 = \text{Avg ARR}_0 \times (1 + \% \text{Diff}_{\text{Hist},0})$$

- Since we now have a way to estimate ending ARR, we can now proceed similarly to the process above, **B) Vendor Does Disclose ARR**.
- Note that ending ARR for all future quarters is equal to Quarterly Renewal ARR (which is derived from the previous Q) + New ARR (which is our driver of the model).

For all future quarters:

Ending ARR_n = Renewal ARR_n + New ARR_n

3) On-Premise Subscription

Accounting for the on-premise subscription model is muddled by ASC 606, which insists that an initial value of the software (i.e., sometimes called Term License) is recognized upon the onset of the contract (including renewals), and another portion (i.e., sometimes called Term Maintenance) is recognized ratably over the duration of the contract. Examples are: VRNS, ESTC, CFLT, and PATH, and the on-premise subscription business of SPLK. An example of such a model can be found in the link [On-Premise Subscription Model](#).

- Contract Terms:** Important characteristics of this kind of contract are: (1) this is a leasing type arrangement in that the customer does not own the perpetual rights to use the software forever, as they do in the perpetual model, but only to use the software over the duration of the contract, and (2) the software is deployed on-premise (or on a premise secured by the customer, which could be a Public Cloud, etc.), versus being accessed through the Internet as a service in the Cloud model.
- Another important characteristic of this type of contract is that there is an **equivalent ARR** [= (Term License + Term Maintenance)/Term Duration], which many companies with this type of model disclose. However, ARR is not an audited number and it's often very difficult to derive reported revenue from stated ARR. Investors are typically skeptical by nature, and what sometimes appears as a "black box" model takes time to convince investors. PATH's and parts of SPLK's model (and resulting stock volatility) are examples of this.
- Basic Premises of Model:** A relationship is established between the Term License and Term Maintenance, and that relationship is used throughout. This relationship varies widely across the Software sector. Some that we have seen include:
 - *Annual* Term Maintenance is equal to a certain percentage (say 20%) of Term License (the Mulesoft and Tableau businesses of CRM are this).
 - *Total* Term Maintenance (regardless of duration) is a certain percentage of Term License (SPLK's on prem subscription business is an example of this). This results in various levels of annual maintenance with different contract durations.
 - Sometimes for companies with a large Open Source component of their technology (e.g., ESTC, CFLT, BASE), License is a smaller portion (sometimes much smaller) of the entire deal.
 - Contract duration has a material effect on how revenue is recognized in any of the above examples. This can result in vast differences in

revenue recognition for the same company deploying the same model for different contract durations even if ARR is equivalent. For instance, a company that employs an on-premise subscription model where annual maintenance is equal to 20% of license and the same ARR of \$1 million would have the following revenue recognitions for one, two, and three-year contracts:

Exhibit 4: Revenue Recognition for On Prem Model, Annual Mtn = 20% License

Years Duration	ARR	TCV	Upfront License	Annual Mtn
1	1	1	0.83	0.17
2	1	2	1.43	0.29
3	1	3	1.88	0.38

TCV = Total Contract Value

\$M other than years duration

Source: Guggenheim Securities, LLC

Therefore, some companies have standardized on annual contracts. Even when there are multi-year deals, the contract is written so that there is a series of annual contracts that are automatically renewed until the end of the contract duration. This smooths out the revenue recognition and makes it more predictable for the company and investors. VRNS is an example of this.

d) Modelling Example: We believe we can model any of the examples above and have. For example, we derive a model below where Annual Term Maintenance is equal to a certain percentage of Term License over a certain duration of years. We first model a particular contract and then model the ending ARR of a quarter.

- **Recurring Revenue is Subscription, consisting of both Term License and Term Maintenance.** However, in this case we will eventually have to normalize for time when considering ARR since License is recognized at the beginning of the contract and on renewals, whereas Maintenance is recognized ratably over the duration of the contract. To calculate Subscription Revenue of a Quarter, we have to estimate both Term License and Term Maintenance. We first establish some variables:
 - i. Let TL = Term License
 - ii. Let D = Duration in years and d = Duration in quarters
 - iii. Let TM% = Annual Term Maintenance as % of License
 - iv. Let R = Annual Gross Renewal Rate
- Now we can Model Subscription Revenue:
 - i. Total Term License consists of both Renewals and New License:
 - Total TL = TL Renewals + New TL
 - Where TL Renewals₀ = TL_{-D} x R^D
 - Total TL₀ = TL Renewals₀ + New TL₀

$$\text{Total TL}_0 = \text{TL}_{-D} \times R^D + \text{New TL}_0$$

- ii. Since renewals are based on previous data, the unknown in forecasting Total License is New License. ***Frankly, New License is the only unknown in forecasting (given the relationship between term license and term maintenance), so it is essentially the key variable in modelling future revenue of the company – and it is a measure of the business momentum of the company.*** As described further below, maintenance is formulaic with the only unknown variable being New TL which determines TL.
- iii. Similarly, if analyzing past results, New License is simply whatever license is left over from Total License after accounting for renewals for a reported quarter, or whatever is modelled when forecasting, so:

$$\text{New TL}_0 = \text{Total TL}_0 - \text{TL Renewals}_0$$

$$\text{New TL}_0 = \text{Total TL}_0 - \text{TL}_{-D} \times R^D$$

Term Maintenance is the Annualized Term Maintenance as a % of License multiplied by the License for all the contracts still in place in the quarter; so, all license recognized over the typical duration of contracts. We assume a portion of the quarterly maintenance associated with the current quarter's license is not recognized in the period (since most contracts were not signed on the first day of the quarter). We assume the same for one quarter beyond the duration.

$$\text{TM}_0 = \text{TM}\% \times (\text{TL}_0/2 + \text{TL}_{-1} + \text{TL}_{-2} + \dots + \text{TL}_{-d/2})$$

Therefore, Total Subscription Revenue can be estimated as

$$\text{Total Subscription}_0 = \text{Total TL}_0 + \text{Total TM}_0$$

$$\text{Total Subscription}_0 = [\text{TL}_{-D} \times R^D + \text{New TL}_0] + [\text{TM}\% \times (\text{TL}_0/2 + \text{TL}_{-1} + \text{TL}_{-2} + \dots + \text{TL}_{-d/2})]$$

- To calculate ARR of a Quarter: To account for the ARR of all contracts at the end of a Quarter, we must add all Term License revenue of the current and previous quarters over the duration of contracts (so if the duration of contracts is 3 years, we must go back 3 years) and divide this number by the duration in number of years (3 in this example). We add to this the annual Term Maintenance associated with the license. This can be estimated by multiplying the total Term License over the duration by TM%, which should give us the annual Term Maintenance associated with all active Term License contracts.

$$\text{ARR} = (\text{TL}_0 + \text{TL}_{-1} + \text{TL}_{-2} + \dots + \text{TL}_{-(d-1)})/d + \text{TM}\% \times (\text{TL}_0 + \text{TL}_{-1} + \text{TL}_{-2} + \dots + \text{TL}_{-(d-1)})$$

$$\text{ARR} = (\text{TL}_0 + \text{TL}_{-1} + \text{TL}_{-2} + \dots + \text{TL}_{-(d-1)}) \times (1/d + \text{TM}\%)$$

- New ARR (or New ACV) of a quarter can be estimated using the New Term License relationship derived above:

$$\text{New ARR} = \text{New TL}_0/D + \text{TM}\% \times \text{New TL}_0$$

$$\text{New ARR} = \text{New TL}_0 \times (1/D + \text{TM}\%), \text{ where } \text{New TL}_0 = \text{Total TL}_0 - \text{TL}_{-D} \times R^D$$

$$\text{New ARR} = (\text{Total TL}_0 - \text{TL}_{-D} \times R^D) \times (1/D + \text{TM}\%)$$

- o Stipulations such as annual term maintenance being 20% of term license may be used more often than others, but each company is different, so we note a couple of approaches below:
 - i. Open source vendors may allot a relatively small portion of the contracted value as Term License, presumably given the service nature of an open source offering, even when there are proprietary technologies sold on top of the open source core. For example, Elastic employs this model, but the license and maintenance portions are flipped relative to most companies. Upfront Term License only accounts for 15-20% of TCV, whereas ratable Term Maintenance accounts for the remaining 80-85% of the contract value. Using these variables, the TCV and ARR for Elastic would be:

$$\text{Assume TL} = 20\% \text{ TCV}$$

$$\text{TCV} = \text{TL}/20\% = 5 \times \text{TL}$$

$$\text{Assume Average Duration} = D = 1.5 \text{ years}$$

$$\text{ARR} = \text{TCV}/D = (5 \times \text{TL})/1.5 = 3.33 \times \text{TL}$$

- ii. Sometimes maintenance is designated as a % of the TCV regardless of the duration. For example, if when ASC 606 was established for a company, it was designated that total (not annual) maintenance would be 20% of license, then annual maintenance is dependent on the duration of the contract. Splunk's Term business is similar to this. Establishing one more variable:
 - o Let TTM% = Total Term Maintenance as % of Term License
 - o Then Annual Term Maintenance, or TM% = TTM%/D

$$\text{ARR} = \text{TL}/D + \text{TM}\% \times \text{TL} = \text{TL}/D + \text{TTM}\%/D \times \text{TL}$$

$$\text{ARR} = \text{TL}/D \times (1 + \text{TTM}\%)$$

If we hold TCV constant, for varying durations, ARR changes as does Annual TM, but TL remains constant. See Exhibit 5.

Exhibit 5: Revenue Recognition for On Prem Model, Total Mtn = 20% License*(variable duration; constant TCV)*

Years Duration	ARR	TCV	Upfront License	Annual Mtn	Total Mtn
1	1.00	1	0.83	0.17	0.17
2	0.50	1	0.83	0.09	0.17
3	0.33	1	0.83	0.06	0.17

*TCV = Total Contract Value; \$M other than years duration**Source: Guggenheim Securities, LLC*

Similarly, if we hold ARR constant, TCV changes with varying durations, and TL changes, but Annual Maintenance remains constant. See Exhibit 6.

Exhibit 6: Revenue Recognition for On Prem Model, Total Mtn = 20% License*(variable duration; constant ARR)*

Years Duration	ARR	TCV	Upfront License	Annual Mtn	Total Mtn
1	1	1	0.83	0.17	0.17
2	1	2	1.66	0.17	0.34
3	1	3	2.49	0.17	0.51

*TCV = Total Contract Value; \$M other than years duration**Source: Guggenheim Securities, LLC*

4) Consumption Models

Consumption Models are usually applied to Cloud based solutions (though they could also be applied to on-premise products). Examples are SNOW and a portion of DDOG's model. We forecast [Consumption Models](#) similar to how we model [SaaS Estimated Ending ARR Model](#).

- a) **Contract Terms:** The primary difference between a traditional Subscription SaaS model and a Consumption model is the payment is not according to a negotiated subscription applied to a specified capacity over a determined amount of time. Payment for a Consumption model is based on the amount of software or service that is consumed by the customer during a period. The customer only pays for what is used. Customers typically start such engagements by paying monthly in arrears for the service, though once they have a better idea of their consumption trends and expectations, they can contract for extended periods at a fixed fee for a certain capacity (presumably at a lower rate).
- b) **Modelling:** Revenue is typically recognized based on the amount of software that is used, or consumed during a period (e.g., month) and is usually recognized in arrears (e.g., after the month is over). Given the relative stickiness of software, this model starts to look like the SaaS Subscription model over time for a given customer. Modelling is usually best served with the SaaS Subscription model where ARR is or is not given as described above (as there's usually a mix of durations, etc.). As described above, we estimate a quarter ending ARR and derive revenue from this.

- c) **Characteristic to Consider:** This model can be a catalyst for significant growth as usage increases, but it also can result in dramatic declines in turbulent times, like it did for DDOG after the onset of COVID due to the short duration of contracts. However, the subsequent bounce-back by DDOG was just as impressive as the moderation was abrupt.

Potential Inaccuracies

Our calculations are simply applying accounting standards and a little bit of math.

The assumptions we make are just that – assumptions – but they’re educated assumptions and not unreasonable. In addition, we are trying to get to something that is not disclosed, but is very important – the new business signed in a quarter with appropriate adjustments (FX, acquisitions, etc.). However, our conclusions could yield results that are not an accurate depiction of what has happened in a quarter because of unknown variables, but it gives us the opportunity to raise these issues with management and gives management an opportunity to explain what might have happened and why our conclusions are incorrect. Some issues that may arise include:

- ***Early or Late Renewals for New ACV Model.*** Since this model assumes renewals are on time, or at least are signed in the quarter they’re scheduled to be, if a renewal comes in early or late, it can either inflate or under-estimate the real New ACV in the quarter. However, if a significant amount is renewed early or late, managements should and usually do disclose such happenings.
- ***Invoicing days (or longer) after a contract is signed for the New ACV Model.*** This can under-estimate the New ACV in the quarter the deal was signed and over-estimate it in the subsequent period. We believe this sometimes may happen as a result of customer requests, though we don’t believe it’s common and we’re hard-pressed to understand why a customer would request this. We’ve been told that this may have impacted Workday’s F2Q23 subscription revenue.
- ***Ramped deals in the New ACV Model.*** For ramped deals, ASC 606 requires recognition of revenue evenly over the duration of the contract. Consider the example of a three-year contract with a total contract value of \$6 million, that is rolled out to the US in the first year for \$1 million, then to Europe in the second year for a total second year value of \$2 million, and then to the rest of the world in year-three for a total third year value of \$3 million. Under ASC 605, \$1 million would be recognized in the first year, \$2 million would be recognized in the second year, and \$3 million would be recognized in the third year – and we would calculate \$1 million of New ACV. However, under ASC 606, \$2 million of revenue would be recognized per year. Our calculation would account for this if Unbilled Receivables were specifically disclosed, but they’re often not. These deals are not very common, but they do happen.
- ***Long Term Deferred Revenue Seeping into Current Deferred Revenue.*** Sometimes, a company that typically bills annually, bills a customer for the entire deal upfront, usually in response to a request by the customer. Again, this is primarily for New ACV models. The vendor does not get credit for this beyond the first year (in the change in Current Deferred Revenue), but it should get credit at some point. We therefore make no adjustment for the creep of Long Term

deferred revenue into Current deferred revenue, giving the vendor credit for the implied renewal over time.

- ***When a company primarily employs a SaaS model, but has some on-premise subscription.*** Unbilled receivables can rarely be a relevant input, but if that metric is not given because of its assessed “materiality” (or lack thereof) – a vague term ill-defined by regulators and companies – our calculation of New ACV can be misleading on rare occasions, especially if there are similar but opposite effects in the year ago quarter. This was the case in the 3Q21 for ServiceNow, where excluding the effects of changes in receivables would yield a 10% decline in New ACV, but when included, the calculation of New ACV growth was +38%. Unfortunately, ServiceNow stopped disclosing Unbilled Receivables in 2022, so we make some assumptions, but it’s difficult, as this metric doesn’t seem to be related to any other metrics by the company. Instead, ServiceNow, like others, is recommending investors focus on RPO (Remaining Performance Obligations) and cRPO (Current Remaining Performance Obligations), neither of which give a good indication of the momentum of the company’s business in the quarter. These metrics are more dependent on the timing of renewals than business momentum.

Companies Mentioned

Adobe Incorporated	ADBE, NC, \$281.40
Amazon.com, Inc.	AMZN, Buy, \$118.01
Couchbase, Inc.	BASE, NC, \$14.51
Confluent Inc Class A	CFLT, NC, \$23.80
Salesforce, Inc.	CRM, NEUTRAL, \$150.17
CrowdStrike Holdings, Inc. Class A	CRWD, BUY, \$167.25
Datadog Inc Class A	DDOG, NC, \$89.76
Elastic NV	ESTC, NC, \$73.07
Microsoft Corporation	MSFT, NEUTRAL, \$241.07
Cloudflare Inc Class A	NET, NEUTRAL, \$57.50
NortonLifeLock Inc.	NLOK, NC, \$20.95
ServiceNow, Inc.	NOW, NEUTRAL, \$388.85
Okta, Inc. Class A	OKTA, NEUTRAL, \$55.65
Palo Alto Networks, Inc.	PANW, BUY, \$166.80
UiPath, Inc. Class A	PATH, NC, \$12.94
SentinelOne, Inc. Class A	S, NC, \$26.53
SAP SE Sponsored ADR	SAP, NC, \$81.46
Smartsheet, Inc. Class A	SMAR, BUY, \$34.75
Snowflake, Inc. Class A	SNOW, SELL, \$173.84
Splunk Inc.	SPLK, BUY, \$82.05
Varonis Systems, Inc.	VRNS, NC, \$27.44
Workday, Inc. Class A	WDAY, SELL, \$156.85
Zendesk, Inc.	ZEN, NC, \$76.50
Zscaler, Inc.	ZS, BUY, \$168.78

Note: Priced at market close as of 09/28/22

Source: FactSet; Guggenheim Securities, LLC

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