SaaS Investors: Mind the Valuation GAP (Growth at Any Price)

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1) Executive Summary

Valuation may be the holy grail of the financial analyst – but as one of its foremost scholars readily admits, it is an imperfect practice requiring a unique mix of both art and science. While the analyst's quest for valuation precision is certainly noble, it can nevertheless bear more in common with that of Monty Python than Sir Galahad. The quest is all the more treacherous when valuing high-growth technology companies, a process that requires risk-weighting cash flows occurring far in the future and discounting them back to the present. SaaS (Software-as-a-Service) companies have recurring revenue, which makes forecasting more predictable (and the companies more valuable) – but low (if not negative) current cash flow, which makes value dependent on cash flows further in the future.

In this paper, we investigate what has driven valuations in the SaaS sector. We also discuss several ways analysts have approached valuations in the space and then suggest a few alternatives that we believe to be more appropriate for today's environment. In SaaS, a historical valuation benchmark may be 5x revenue, 30% revenue growth, and 5% EBITDA margin – though the market currently averages 5.5x revenue, 32% revenue growth, and -10% EBITDA margin. While the "unicorn" market of the past year may make headlines, technology companies have shown substantial volatility since 2013, when Dave Kellogg of Host Analytics plotted valuation multiple against revenue growth and found a clear relationship: approximating valuation multiple as 1 + (growth rate % / 10). Upon initial observation, it would appear that profitability is becoming a more important determinant of valuations.

We explore the relative and combined impact of revenue growth, profit margin, and overall scale on valuation multiples. We lay out a framework for reexamining how the relative importance of these variables fluctuate over the course of the market cycle and how to use the model to value SaaS companies. We conclude that the equity market's "DCF in the sky" has generally prioritized revenue growth over profitability, except during times of market stress when growth and profitability are more equally weighted. We share both two and five-factor models, discuss which companies are above and below their values predicted by the rule-of-thumb, and will update them periodically.

We examine Brad Feld's "Rule of 40%," and find that a broader five-factor model offers more explanatory power as to the drivers of SaaS valuations. Revenue growth is always important, EBITDA margin is important only during market stress (negatively correlated since 2011, but less so since 2013), and both gross margin and scale are slightly positively correlated. Examining the five-factor plot as of 12/31/15, the public SaaS ecosystem can be divided into three segments: **market darlings**, **prove-its**, and **underperformers.** However, given its complexity, this model has limited utility on an everyday basis. We construct a simplified two-factor model that shares the intuition of the Rule of 40% and captures much of the relationship between revenue growth, EBITDA margin, and valuation multiple. Our two-factor model yields the following SANE[1] formula as of 12/31/15:

Valuation Multiple = 2.6 + 10.8(LTM Revenue Growth %) + 4.7(LTM EBITDA Margin %)

[1] Schlecht and Newton Equation

2) The SaaS Valuation Quest

There is a paucity of long-term studies on SaaS valuations – likely owed to both the relatively short existence of the sector and to its particular (and atypical) financial profile. Because SaaS companies typically have high revenue growth rates and negative EBITDA for long periods of their existence, investors have historically focused on revenue multiples in the sector. A focus on high growth at the expense of near term profitability is a logical financial strategy for a SaaS company attacking a large market. SaaS companies need to invest upfront in product development and customer acquisition, in order to receive long-term streams of revenue paid out over the lives of their customers. Given the importance of investing in acquiring market share within a large total addressable market, early-stage recurring-revenue businesses seek to maintain high growth over an extended period of time. Neeraj Agrawal of Battery Ventures describes this path of revenue growth as "The SaaS Adventure," meaning the go-to-market travails of early-stage companies and the tactics entrepreneurs employ at each stage to drive revenue.

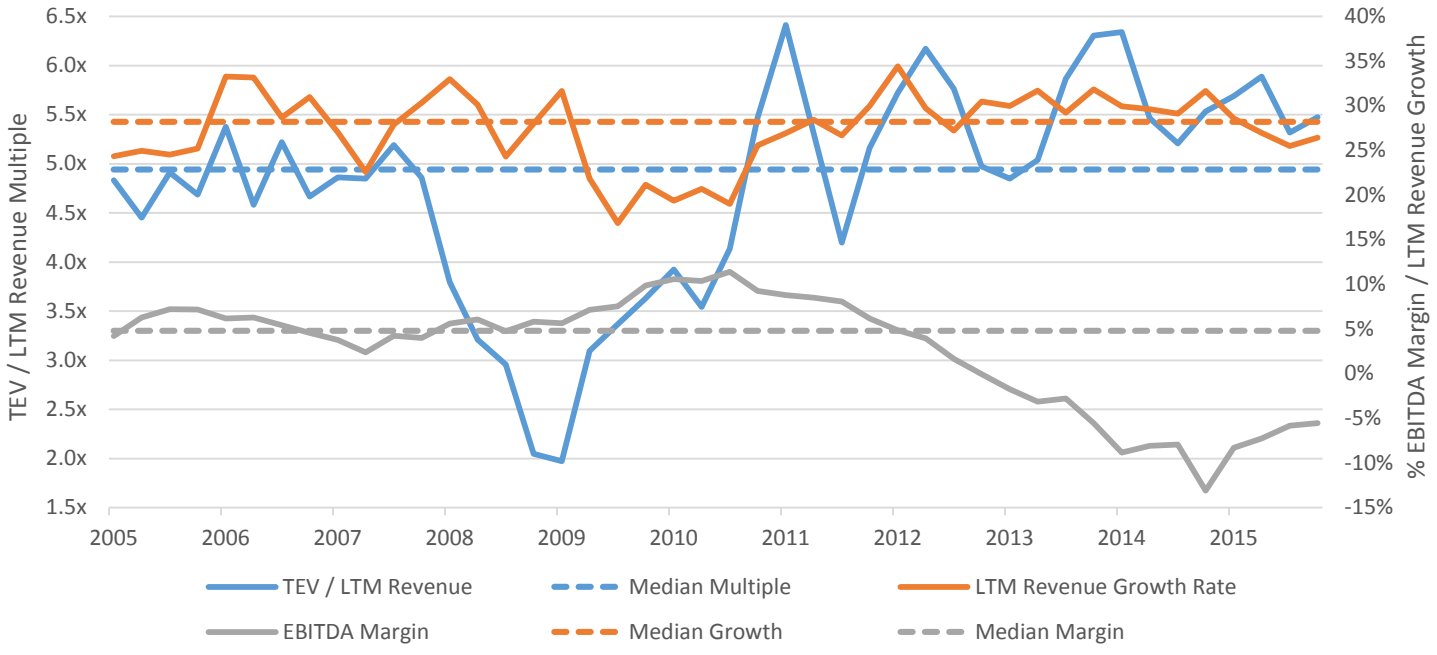
With negative earnings and asset-light balance sheets, the analysis of a SaaS company with traditional financial performance metrics is difficult. As a result, venture capitalists and other analysts have devised their own array of SaaS-specific performance metrics. When it comes to SaaS valuation, a commonly-held rule of thumb (that recent markets have cast doubt on) is that a seed or early-stage SaaS business should trade for 10-15x ARR, while a growth stage business should trade for 5x, with a premium or discount awarded for other qualitative traits such as management ability, sales model, or cost structure.

3) Setting the Baseline for SaaS Valuations

In an article last June, Alex Niehenke of Scale Venture Partners confirmed that over the past decade, the public SaaS universe traded at a median revenue multiple of 5x, while growing revenue by 30%. He observed a clear valuation premium would exist during times of euphoria (late 2013 through early 2014) and a discount to the historical value during times of panic or recession (late 2008 through late 2010). Employing our own sample of 63 SaaS companies over the 44 quarters since 2005, we replicate Niehenke's analysis below, add EBITDA margin, and calculate a median revenue multiple of 4.9x, median revenue growth of 28%, and median EBITDA margin of 5%. The minor differences are due to timeframe and sampling error.

Exhibit 1: Historical Growth, Margin, and Valuation

TEV / LTM Total Revenue and Median (Left Axis) / EBITDA Margin and LTM Revenue Growth and Medians (Right Axis)



Source: Capital IQ, Catalyst analysis

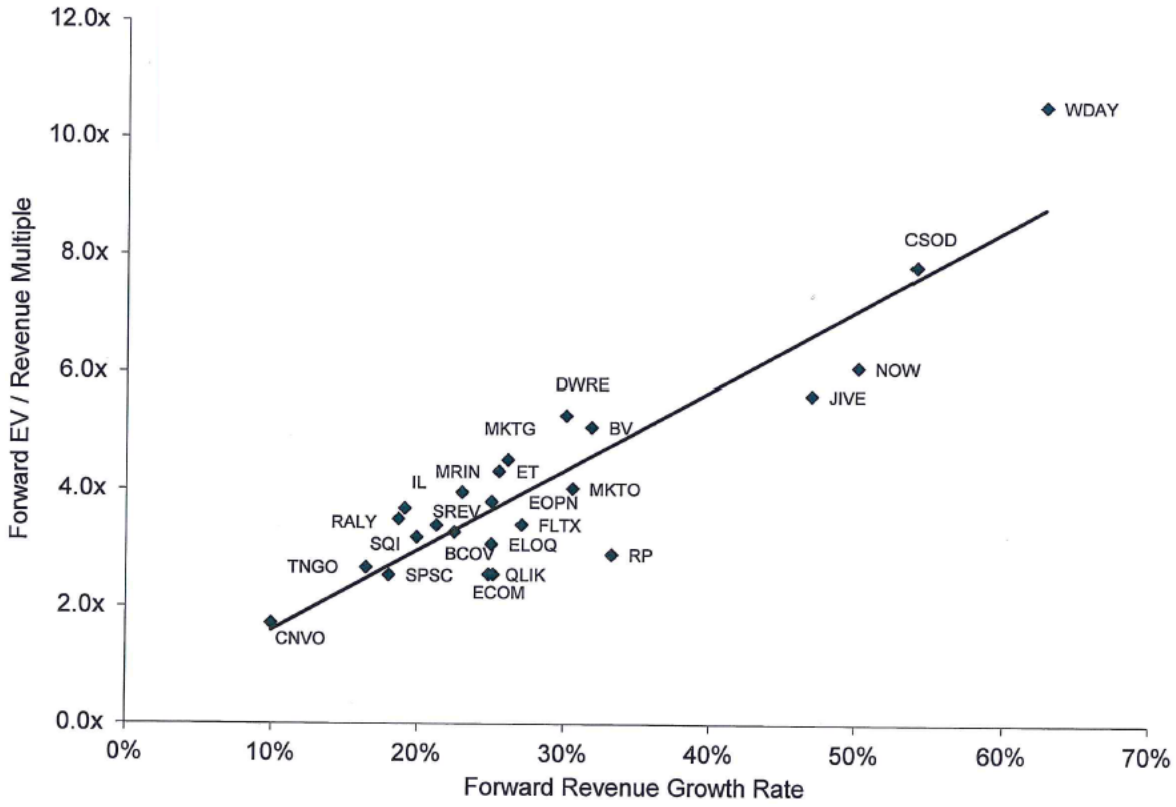
This comparison suggests a number of insights. First, there appears to be a generally strong and positive relationship between revenue growth and valuation over time, with the only sustained divergence (in magnitude, not in direction) occurring during the financial crisis of 2008 and its immediate aftermath. Second, growth has remained stable around its median of 28% over the entire period, with its only appreciable slowdown occurring during the 2009 - 2010 period after the financial crisis when median revenue growth slowed to around 20%. Third, EBITDA margin has shown much more variability, trending around 5% before and during the financial crisis, rising to over 10% after the financial crisis (when growth slowed as mentioned above), and since declining to -5% to -10% since late 2012. Finally, the last two observations together suggest that for the industry to maintain its 30% growth rate it requires more cash burn today than it did prior to 2012.

4) The Primacy of Revenue Growth in Valuation

While the above analysis provides the baseline medians of revenue multiple, revenue growth, and EBITDA margin for the sector as a whole, it does not explain the variation in valuation multiples among companies with different rates of revenue growth and margin levels. Writing in mid-2013, Host Analytics CEO Dave Kellogg found that growth was the primary driver of SaaS company valuations and that there was "basically no reward for profitability." This sentiment has been echoed since by both market observers and bankers alike, who have reproduced the scatter plot of revenue growth against valuation for public SaaS companies.

Exhibit 2: Valuation and Growth in 2013

Public SaaS TEV / NTM Revenue Valuation Multiple (Y-Axis) vs. NTM Revenue Growth (X-Axis)



Source: Undisclosed banker deck via [Dave Kellogg]

Kellogg developed a neat valuation rule of thumb:

Forward Revenue Multiple = 1+ (Growth Rate % / 10)

While this is certainly an elegant model, it is ultimately illogical. If one company has revenue growth of 30% and 10% EBITDA margins, it should be worth more than another company with 30% revenue growth and negative 40% EBITDA margins (all else being equal). With the benefit of hindsight, Kellogg's article couldn't

have been timed better to highlight the primacy of revenue growth over profitability, arriving at the absolute trough in the relationship between EBITDA margin and valuation, according to our analysis highlighted below. While revenue growth may have been the primary driver of valuation in 2013, the market of 2014 - 2015 has seen an increased emphasis on profitability in addition to its traditional focus on growth.

5) The "Rule of 40%" and the Role of EBITDA Margin

An approach to integrate both revenue growth and EBITDA margin into a rule of thumb was popularized by Brad Feld of the Foundry Group. The "Rule of 40%" contends that at a healthy, at-scale SaaS company, the sum of the revenue growth rate and EBITDA margin should be equal to or greater than 40%. In other words, a SaaS company growing at 20% should have a positive 20% EBITDA margin or better (20% + 20% = 40%), and that a company growing at 60% should have a negative 20% EBITDA margin or better (60% - 20% = 40%). Feld's back-of-the-envelope calculus resonated across the industry: from Fred Wilson of Union Square Ventures to Lighter Capital, David Cummings, and Saasmetrics.

While the Rule of 40% is simple and elegant, it is insufficient for our purposes. First of all, it is binary – a company is either declared healthy or it isn't – and doesn't tell us what we should pay for a company that either meets or doesn't meet the rule. Paying 3x revenue for a company growing 40% with negative 20% EBITDA margins may ultimately provide a better return than paying 10x revenue for a company growing 60% with negative 20% EBITDA margins. Secondly, it is unrealistic – in our sample of 63 publicly traded companies, only 10 meet the 40% Rule at present. Recalling our earlier findings that over the past 11 years, the SaaS universe has experienced median growth of 28% and median margin of 5%, above-average performers might be expected to exceed 33% (rather than 40%) in terms of both metrics combined. While companies that meet

the 40% Rule do tend to trade at higher multiples than those that do not, the non-compliant companies are not necessarily "unhealthy" and unworthy of funding. So, while the Rule of 40% is a useful and intuitive screen, it doesn't integrate with a framework for calculating valuation, the analyst's ultimate quest.

Profitability, or a path to profitability, is an increasingly material factor in the current market and needs to be worked into an effective valuation methodology. For example, Clare Capital found that 50% of those with positive-EBITDA have experienced multiple expansion over the past quarter, compared to only 10% of those with negative-EBITDA. This is an interesting signal, yet intuition tells us that the bifurcation of companies between positive and negative EBITDA margin is also somewhat binary or artificial. What should matter is the degree of profitability (positive or negative) and its relationship to revenue growth.

6) Growth, Margin, and Scale: A Statistical Framework (Historical)

To drill down on this idea, we started with a multivariate approach to valuing SaaS companies. We incorporated five variables: (1) last twelve months (LTM) revenue growth, (2) next twelve months (NTM) revenue growth, (3) gross margin, (4) EBITDA margin, and (5) market cap (as a proxy for scale). We feel that differences in forecast (NTM) vs. realized (LTM) revenue growth are important. Forward growth is technically more important for valuation than historical growth, but is based on estimates, while historical growth is a fact. We've previously discussed the importance of EBITDA margin, but as Tomas Tunguz recently wrote, gross margin is extremely important as well because better gross margins imply better product, company, and financial health: "the higher the gross margin, the more revenue can be reinvested in growth, the less money the business must raise to grow, the less dilution incurred – not all revenue dollars are created equal, but all

gross profit dollars are." Scale is also important to examine as the valuation premia of clear market leaders like Salesforce.com, Ultimate Software, and Adobe is apparent under cursory review of the market landscape.

With this basis, we approach the problem two ways: through a panel regression of the five factors over time and with a cross-sectional multivariable approach. In the first analysis, we examine the correlations of each variable to valuation multiple over time. As the quarter-to-quarter variation is somewhat noisy, the table below shows a 2 year moving average of each variable's 1 year correlation coefficient with TEV / LTM Revenue, from 2005 to the present.

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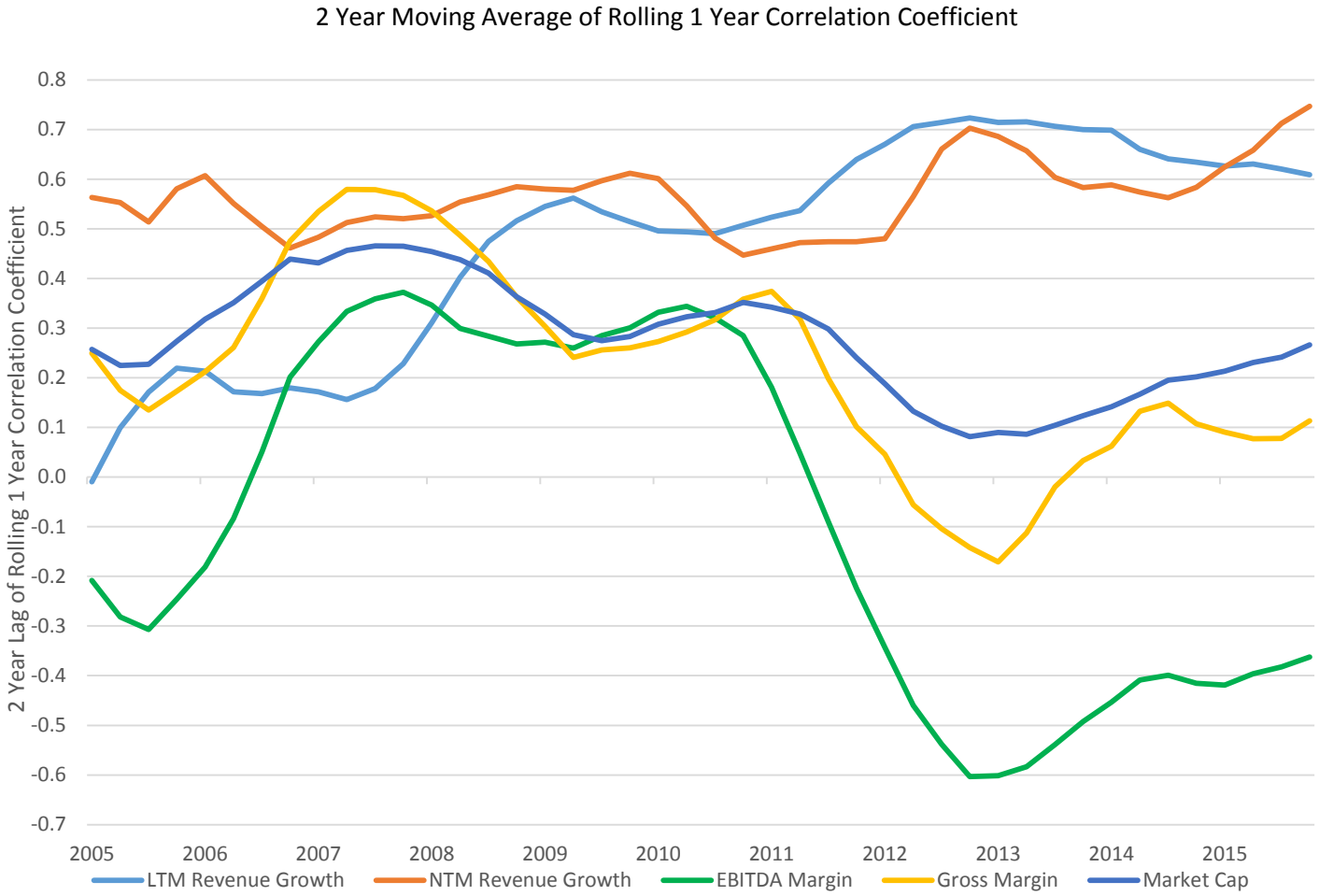
Exhibit 3: Historical Determinants of SaaS Valuation Multiples

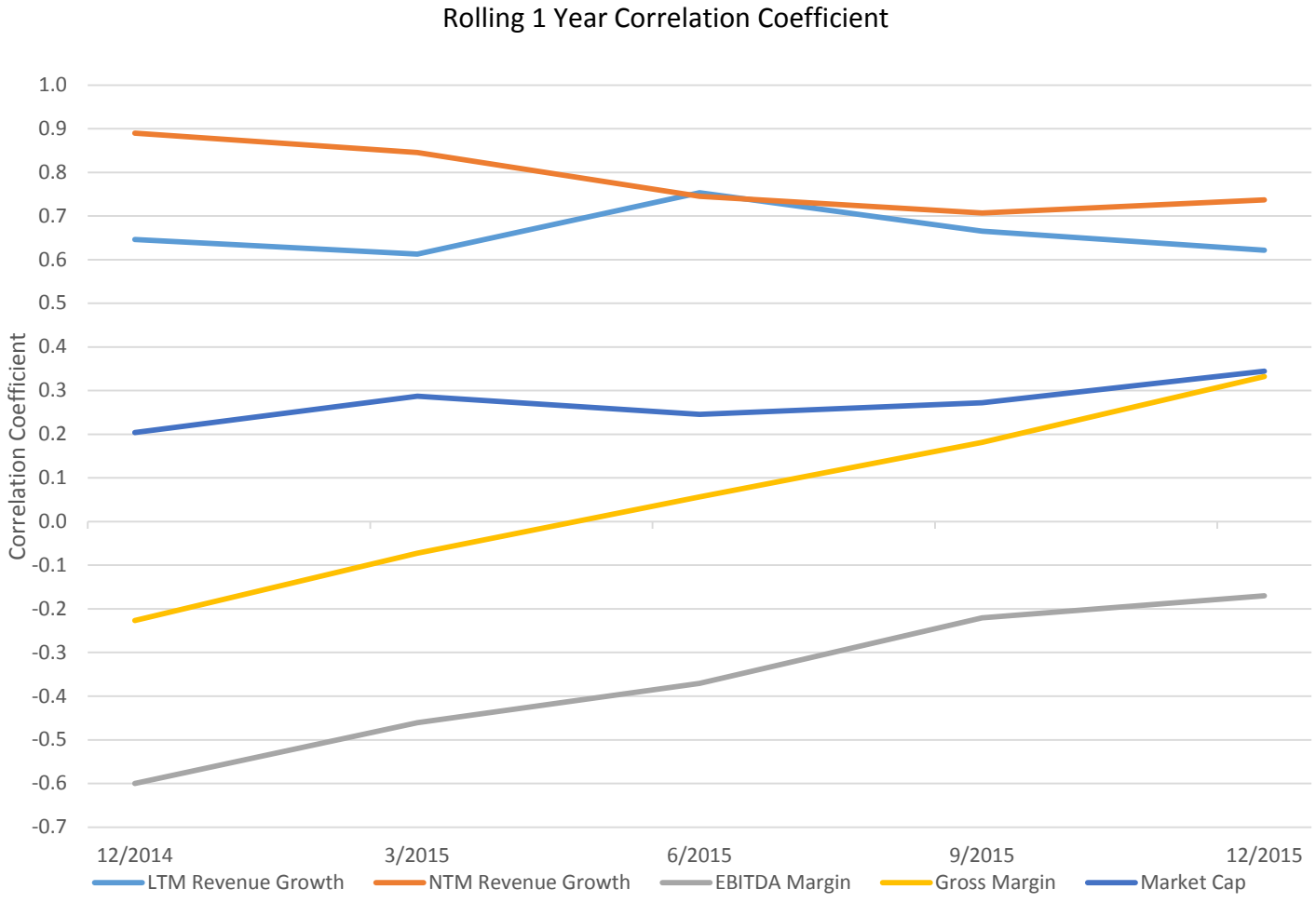


Source: Capital IQ, Catalyst analysis

Interpreting the graph yields a number of conclusions. First, the correlations of the two revenue growth variables track together over time (unsurprisingly) and for the most part remain high throughout the time horizon. Second, we can observe that the correlation of gross margin tracks most closely with that of market capitalization and that both have been gradually declining over time. Our non-scientific interpretation of this observation is that the market is distinguishing more among mid-sized SaaS companies based on fundamentals and that gross margin, which is positively related with company scale, has tracked accordingly. Third, the relationship of EBITDA margin to valuation is the most volatile over time. During periods of low

market volatility (2005 - 2006 and 2012 - Present), EBITDA margin recedes in importance and the markets favor the companies that produce the highest growth, which usually means those with the largest EBITDA "burn rate." During periods of high market volatility (2007 - 2011) the correlation of EBITDA margin to valuation multiple is similar to that of revenue growth. While EBITDA has been growing in importance since the beginning of 2014, it is still much less correlated to valuation than revenue growth.

Exhibit 4: Recent Change in Determinants of SaaS Valuation Multiples



Source: Capital IQ, Catalyst analysis

We can also observe the changes in one-off correlations to valuation in these five variables over the trailing year. The impact of revenue growth (both LTM and NTM, but notably NTM) is flat, while the impact of both size (market cap) and margin is increasing. This is largely consistent with a "flight to quality" movement or "risk-off" attitude in the SaaS market – not so much the popping of a bubble, but of a potential return to normalcy: as the SaaS market matures, it must ultimately look to future profitability. Two aspects of the changes in margin correlation are particularly striking: first, the shift in gross margin correlation from a negative to positive coefficient (-0.23 to 0.35), and second, the sheer magnitude of the change in EBITDA margin correlation of 0.45 (-0.59 to -0.14). While it may not yet be correct to say that EBITDA margin is a determinant of valuation, we are certainly able to say that it is substantially less negatively related to valuation than it has been – and that this change is happening rapidly and in tandem with an overall recalibration in multiples.

7) Growth, Margin, and Scale: A Statistical Framework (Cross Section as of 12/31/15)

Turning from longitudinal study to cross-sectional snapshot, we find the regression as of 12/31/15 to be robust and statistically significant at a 5% confidence interval. Our regression equation shows that:

Valuation Multiple = 4.9(LTM Growth %) + 21.2(NTM Growth %) +4.4(EBITDA Margin %) + 4.7(Gross Margin %) + 0.1(Market Cap, USD in Billions) - 2.5

Unsurprisingly, revenue growth takes center stage, but all coefficients are nevertheless positive (higher variable values yields higher valuation multiple). On a combined basis, LTM and NTM revenue growth were

responsible for 43% of valuation, compared to 35% from margin, and 22% for market cap and the error term. Disaggregating revenue growth, NTM exerted more than twice as much impact on value (30%) than LTM (13%), signaling the market's view for future growth supersedes historical growth. For margin, only 8% of value relates to EBITDA margin, compared to 27% for gross margin. We believe gross margin serves as a measure of product quality and efficiency, a straightforward take on overall company health. EBITDA margin, on the other hand, incorporates many items in addition to cost of revenue: sales and marketing expenses (an important signal of sales efficiency and customer retention relative to revenue growth), general operating expenses (which can vary based on the perceived need for future scale), and product development expenses (which can vary based on long term investment strategy). Our regression output is copied below.

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Exhibit 5: Multivariable Regression Output as of 12/31/15

Regression Statistics	
Multiple R	0.85
R Square	0.73
Adjusted R Square	0.71
Standard Error	1.81
Observations	63

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	502	100	31	0
Residual	57	187	3		
Total	62	689			

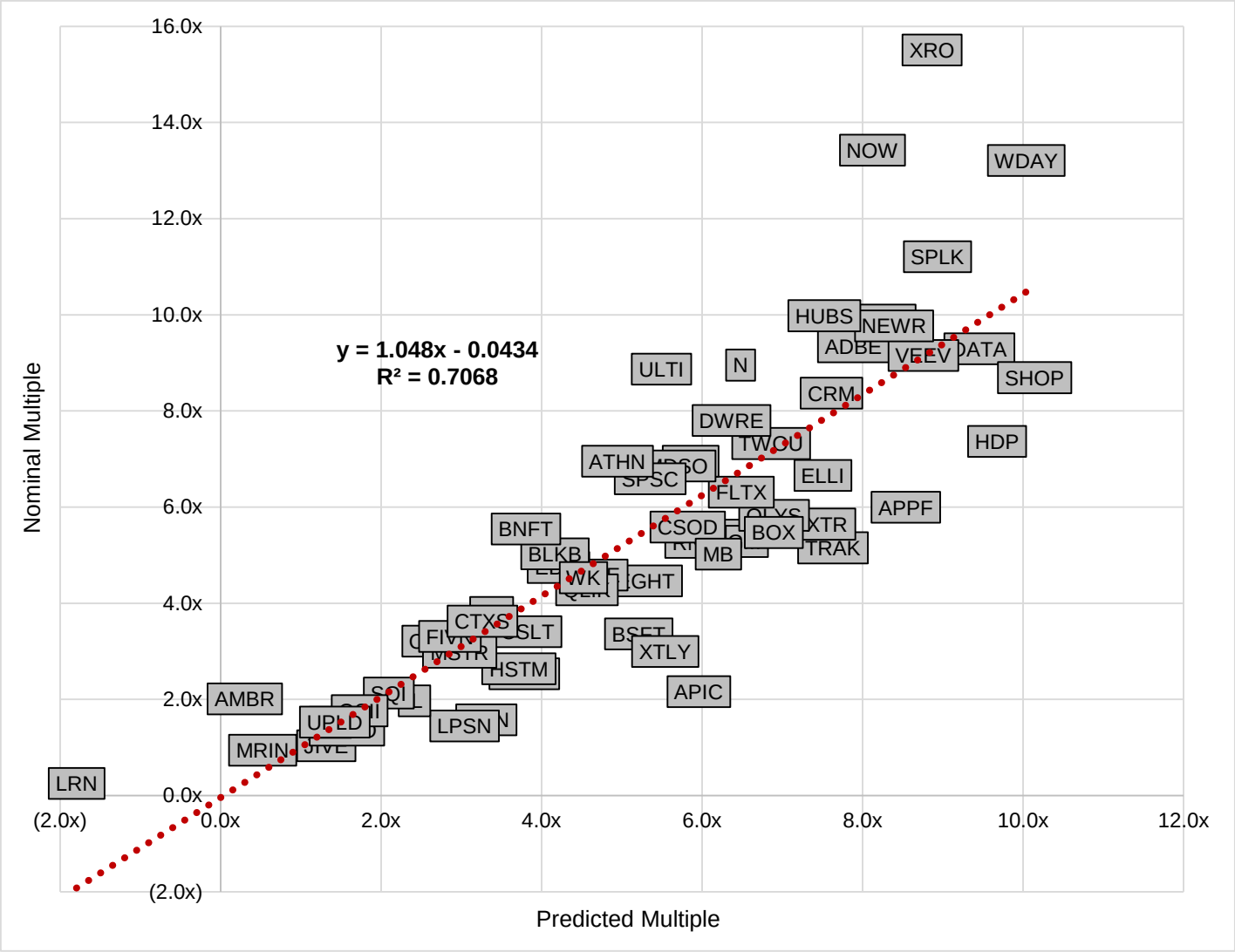
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-2.51	1.44	-1.74	0.09	-5.40	0.38
LTM Revenue Growth	4.86	1.50	3.25	0.00	1.87	7.86
NTM Revenue Growth	21.19	3.98	5.33	0.00	13.22	29.15
EBITDA Margin	4.47	1.08	4.15	0.00	2.32	6.62
Gross Margin	4.74	2.19	2.16	0.03	0.35	9.12
Market Cap ($,billions)	0.06	0.03	2.17	0.03	0.00	0.12

Source: Capital IQ, Catalyst analysis

By employing a long term perspective and disaggregating valuation into its constituent parts, we were able to better capture the determinants of value than by looking at revenue growth alone. We would reiterate that the statistical relationships in such a model diminish in significance as time period is extended – accordingly a retrospective back test (or prospective use as an investing tool) would require constant recalibration. However, this cross sectional analysis is useful in that it provides a framework for valuation of SaaS companies based on a few readily-observable data points. By plotting the valuation multiple predicted by our regression equation horizontally against the actual valuation multiple for each in the market vertically, we can see the strength of the relationship along with a few clusters of outliers.

Exhibit 6: Five-Factor Regression Plot as of 12/31/15

Predicted Multiple (X-Axis) vs. Nominal Multiple (Y-Axis)



Source: Capital IQ, Catalyst analysis

Under this analysis, 36 of the 63 companies in the universe (57% of the total) fall within 20% of their predicted valuation. Of the 43% that fall outside of the valuation, we can bucket them into 4 major groups.

Group one would be the **market darlings**: these are the companies with actual enterprise value to LTM revenue multiples above 5x and that are valued more than 20% above their predicted multiple based on metrics alone. They are, in descending order of valuation –

- Xero (XRO) – actual 15.5x vs. predicted 8.9x – SMB accounting software
- ServiceNow (NOW) – actual 13.4x vs. predicted 8.1x – service management platform
- Workday (WDAY) – actual 13.2x vs. predicted 10.0x – enterprise ERP
- Splunk (SPLK) – actual 11.2x vs. predicted 8.9x – business intelligence/ big data
- Hubspot (HUBS) – actual 10.0x vs. predicted 7.5x – marketing automation
- Netsuite (N) – actual 9.0x vs. predicted 6.5x – full suite ERP/CRM
- Ultimate Software (ULTI) – actual 8.9x vs. predicted 5.5x – HR software and payroll
- athenahealth (ATHN) – actual 7.0x vs. predicted 4.9x – practice management, EHR, revenue cycle management
- Benefitfocus (BNFT) – actual 5.5x vs. predicted 3.8x – benefits management platform

The above list contains a number of "brand name" horizontal-platform SaaS companies that are leaders in their respective markets, each of which has a large potential market opportunity. Seven of the nine companies could be classified within the enterprise resource planning (ERP) arena, whereby they are embedded in their customers' business processes, and thus theoretically subject to lower customer churn (XRO, NOW, WDAY, N, ULTI, ATHN, BNFT). Most of these are horizontal ERP providers, except athenahealth, which covers a huge vertical (healthcare services). Hubspot (HUBS), a marketing SaaS provider, has a strong history of performance with a highly diversified customer base. Splunk (SPLK) is also a leader in a hot space (big data) with a history of strong performance.

The next group would be the **prove-its.** These are companies that have strong enough metrics to be valued above 5x revenue but trade at a value more than 20% below their predicted value. These include:

- Hortonworks (HDP) – actual 7.4x vs. predicted 9.7x – Hadoop development platform
- AppFolio (APPF) – actual 6.0x vs. predicted 8.5x – property management SaaS
- Textura (TXTR) – actual 10.0x vs. predicted 13.2x – construction management SaaS
- Box (BOX) – actual 11.2x vs. predicted 8.9x – document management
- Trackm8 (TRAK) – actual 5.2x vs. predicted 7.6x – fleet tracking software
- MINDBODY (MB) – actual 5.0x vs. predicted 6.2x – health and wellness SaaS[2]
- Broadsoft (BSFT) – actual 3.4x vs. predicted 5.2x – unified communications platform
- Xactly (XTLY) – Actual 3.0x vs. predicted 5.5x – sales force management
- Apigee (APIC) – Actual 2.2x vs. predicted 6.0x – API development platform

This list of companies includes five that are vertically-focused and thus potentially face concerns about size of their addressable markets (APPF, TXTR, MB, BSFT, TRAK), two that provide developer tools and are potentially viewed as less-sticky (HDP, APIC), and Box (BOX). Five of the eight in this group were 2015 IPOs, so perhaps Wall Street is taking a "wait-and-see" approach.

If we look at the companies that trade above 5x actual revenue but within 20% of their predicted valuation, we find nine well-performing companies that, like Hubspot, could be considered "brand name" horizontal-platform SaaS companies focused on the sales and marketing or ecommerce-enablement side of the house (ZEN, ADBE, SHOP, CRM, DWRE, CVT, MKTO, LOGM, SPSC). There are three analytics/big data companies (DATA, NEWR, MDSO). There are also several vertical SaaS companies (VEEV, TWOU, ELLI, FLTX, RNG), a security company (QLYS), and one HCM/ERP company (CSOD).

The third outlier category would be the **underperformers**: companies that are valued less than 5x and trade more than 20% below their predicted value, which is also less than 5x. These include:

- Healthstream (HSTM) – actual 2.6x vs. predicted 3.7x – healthcare workforce solutions

[2] Disclosure: MINDBODY is a portfolio company of Catalyst Investors. All data included herein is from Capital IQ; no proprietary information or data was included or referenced.

- inContact (SAAS) – actual 2.5x vs. predicted 3.8x – call center technology platform
- Intralinks (IL) – actual 2.0x vs. predicted 2.4x – deal rooms
- Halogen (HGN) – actual 1.6x vs. predicted 3.3x – talent management
- Liveperson (LPSN) – actual 1.4x vs. predicted 3.0x – chat software
- Jive Software (JIVE) – actual 1.4x vs. predicted 3.0x – social collaboration software

The companies in the underperformer category have a "niche-y" feel: a lot of "tools" as opposed to real "platforms". The only horizontal platforms on the list are Halogen (HGN) and inContact (SAAS).

The companies valued below 5x revenue and trade within 20% of predicted multiple or above, however, look like the companies in the market darlings and prove-its categories: vertical solutions, security, horizontal platforms for supply-chain, marketing or ERP, and analytics.

The takeaway from this is that horizontal ERP and analytics companies tend to have near-predicted or above-predicted multiples and marketing-oriented and vertical companies tend to have near-predicted or below-predicted multiples relative to what their statistics would suggest. Niche tools around marketing or collaboration and development platforms tend to receive below-predicted multiples. (With some exceptions, of course.)

This approach to SaaS valuations is validated when we assess the how the model performs in reality. The last 6 months have seen valuations decline, reverting back to their longer-term mean. To assess the predictive value of the model, we regress YTD change in company market value against a variety of valuation metrics as of year-end. Employing equal-weighted benchmarks, we find that overall, YTD 2016 stock performance has been moderately negatively correlated (-0.30) with each company's year-end valuation multiple (both NTM and LTM revenue). Between 12/31/15 and 3/31/16, the cheapest half of companies on the basis of nominal multiple returned 8.1% more than the most expensive half. Likewise, on the basis of

multiple predicted by the five-factor model, the cheapest half of companies returned 12.1% more than the most expensive half. Finally, on the basis of percentage difference between predicted and nominal multiple, the cheapest half of companies returned 2.2% more than the overvalued half. This type of analysis could potentially be used as a framework for pairs trading, where an investor might go long an undervalued security and short an overvalued one with similar risk exposures. As private market investors, we don't explore that concept further in this paper, but it is a potential source of investment alpha.

8) Growth and EBITDA: A Simplified SaaS Valuation Model

While we have discussed the Rule of 40%'s shortcoming as a valuation metric, we admire its simplicity, especially when evaluating private companies. Trailing revenue growth is a fact (vs. often-overestimated next year projections), while EBITDA margin captures the full operational efficiency of a business (vs. gross margin, which can vary and does not include sales, marketing, R&D, and G&A). Scale is not a substantive factor, as most private SaaS companies would fall into the micro-cap category. Clearly, having a "rule of thumb" to value a private SaaS company by using just revenue growth and EBITDA margin would be useful.

Running this two-factor regression, we find that ~50% of valuation multiple comes from growth, compared to ~15% from margin and ~35% for the error term, as opposed to the equal weights implied in the Rule of 40%. The simplified regression remains significant, but experiences a drop in both correlation and R^2 as compared to the multivariable regression discussed earlier. With regression output copied below, the SaaS valuation equation is thus:

$$\text{Valuation Multiple} = 2.6 + 10.8(\text{LTM Revenue Growth \%}) + 4.7(\text{LTM EBITDA Margin \%})$$

Exhibit 7: Two-Factor Regression Output as of 12/31/15

Regression Statistics	
Multiple R	0.66
R Square	0.43
Adjusted R Square	0.41
Standard Error	2.56
Observations	63

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	296	148	23	0
Residual	60	393	7		
Total	62	689			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2.55	0.55	4.68	0.00	1.46	3.65
LTM Revenue Growth	10.76	1.64	6.57	0.00	7.48	14.04
LTM EBITDA Margin	4.70	1.42	3.31	0.00	1.86	7.54

Source: Capital IQ, Catalyst analysis

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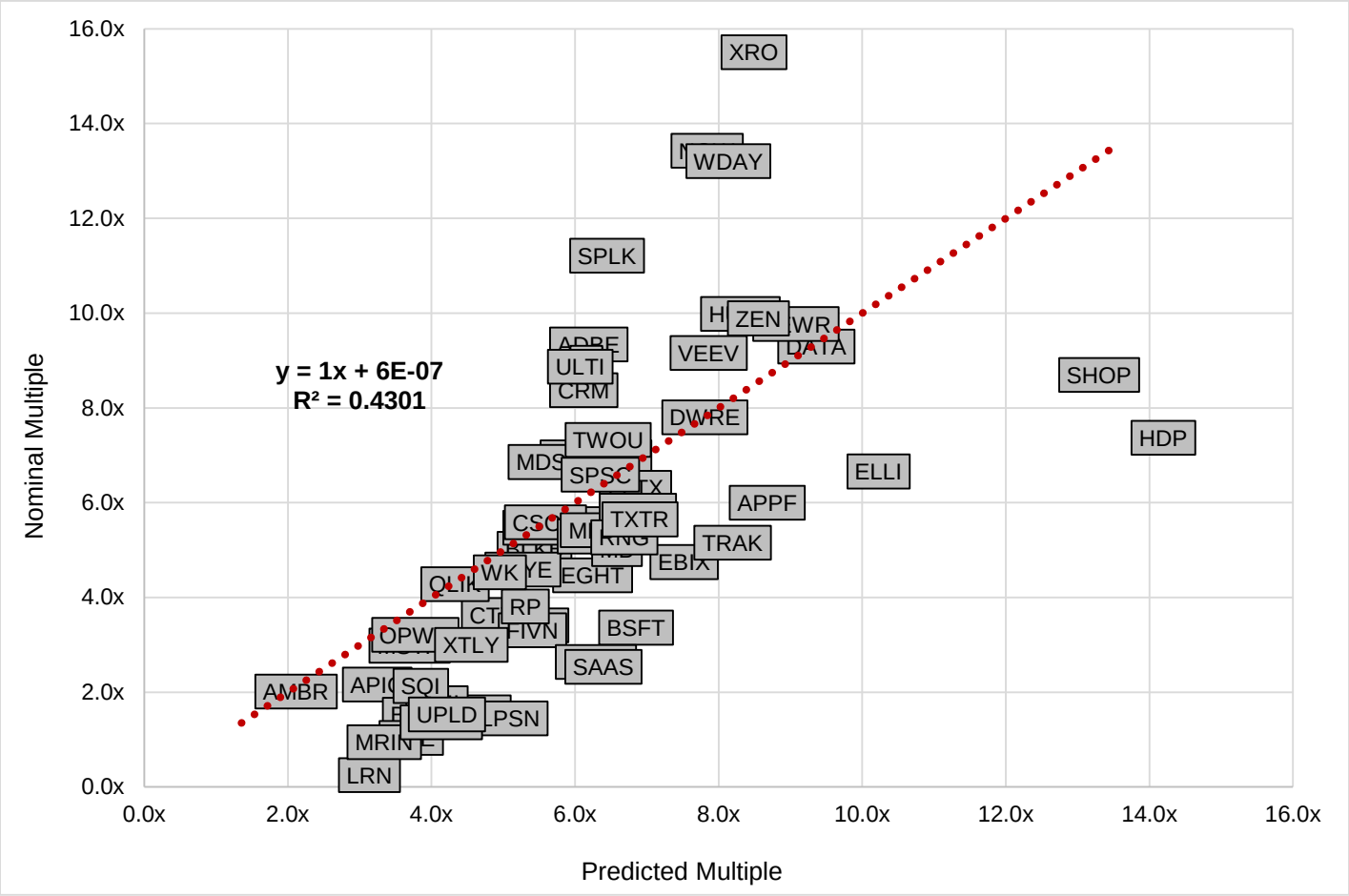
Exhibit 8: Two-Factor Regression Plot as of 12/31/15

Predicted Multiple (X-Axis) vs. Actual Multiple (Y-Axis)



Source: Capital IQ, Catalyst analysis

In the two-factor model, the same market darlings remain, with only Benefitfocus (the least well-known of the previous group) falling off the list, into the fairly-valued category. Joining the list are some mega-caps like Salesforce.com (CRM) and Adobe (ADBE), fast-growing vertical SaaS companies like Veeva (VEEV) and 2U (TWOU), and analytics company Medidata (MDSO). Falling from the fairly-valued into the ranks of the prove-its are 8x8 (EGHT), Ellie Mae (ELLI), Shopify (SHOP), and Ebix (EBIX) – mostly vertical SaaS companies – and Shopify, for whom analysts expect a substantial slowdown in growth this year. Textura and Box, on the

other hand, leave the ranks of the prove-its to join the fairly valued, and among the highly valued companies, Apigee fell into the fairly-valued group valued at under 5x revenue. Joining the ranks of the underperformers are Castlight Health, Five9, SciQuest, Quality Systems, Bazaarvoice, Upland, and Tangoe – all either smaller vertical SaaS companies or more narrow marketing and ERP tools like Bazaarvoice and Tangoe. Overall, the same patterns observed earlier in the five-factor model hold consistently under the two-factor model, with a small number of outliers among the highly-valued market darlings and prove-it companies.

Using this back-of-the-envelope method, we can generate coefficients for both variables (Revenue Growth and EBTIDA Margin) on a quarterly basis to reflect the evolution of the market's weighing machine over the short term. By combining the output of this model (the two-factor equation shown above), we can back into the predicted valuation multiple of the overall universe by multiplying the regression coefficients by the average growth and margin of the SaaS universe, and then calculate the predicted LTM revenue valuation multiples of a few examples below:

SaaS Universe Average: 2.6 + 10.8(LTM Growth of 32%) + 4.7(EBITDA Margin of -10%) = 5.6x (vs. 5.5x actual)

DemandWare (DWRE): 2.6 + 10.8(LTM Growth of 48%) + 4.7(EBITDA Margin of -14%) = 7.4x (vs. 7.8x actual)

FireEye (FEYE): 2.6 + 10.8(LTM Growth of 46%) + 4.7(EBITDA Margin of -64%) = 4.6x (vs. 4.6x actual)

As one might expect from a regression-based equation, the differences between actual and predicted values are quite small. Both companies (along with the universe on average) are growing rapidly while burning cash, but these examples highlight a strength of this approach over prior methods. The Rule of 40% would suggest summing growth and margin percentages and applying a multiple to the result: the universe would be

rated 22/40, DemandWare at 34/40, and FireEye at -17/40. At first blush, this may not seem unreasonable, particularly when comparing the universe as a whole to DWRE, which gets a premium over a typical SaaS company and has a higher Rule of 40% score. While the two companies have comparable rates of growth, the impact of the difference in profitability on valuation is captured better by the regression-based approach, rather than the Rule of 40%. FEYE is ostensibly four times less profitable than DWRE and profitability makes up half of the Rule of 40% equation, but FEYE is clearly not worth half as much on a multiple basis (though possibly between a quarter or third less). A regression doesn't simply account for the absolute value of growth or margin factors, but rather their relative importance within and among companies in the sample. More specifically, the two-factor model implies that revenue growth's coefficient is two to three times larger than that of EBITDA margin, rather than the equal weight implied by the Rule of 40%.

9) Conclusion

In the valuation quest, SaaS analysts struggle with the challenge of forecasting and discounting the future cash flows of high-growth (and inherently unpredictable) businesses. To provide a benchmark for valuations, we articulated the framework of a regression-based approach that more accurately captures both changes in the determinants of value over time and the impact of profitability more generally. Through a broader five-factor model (incorporating both realized and predicted revenue growth, gross and EBITDA margin, along with scale) and a simpler two-factor model that melds our quantitative approach with the intuition of the Rule of 40% and captures the majority of the variance explained by the five-factor model. Finally, in applying the model to the analysis of individual companies, we suggest how this rule can be used to

ground the expectations embedded in lofty valuations in the reality of growth and profitability, and we plan to update our models and outlook on an ongoing basis.

10) Appendix

Our 12/31/15 data set includes 63 currently publicly-traded SaaS companies. Earlier dates in the data set include a more limited number of companies and do not include SaaS companies that were then publicly traded but have since been acquired or otherwise removed. In addition, the current set of SaaS companies includes some companies that have transitioned from a more traditional on-premise software model. In other words, the data is more robust the closer we get to the current date. The selected companies are listed alphabetically below:

Company Name	Ticker	Market Cap	TEV / NTM Revenue	TEV / LTM Revenue	NTM Revenue Growth (%)	LTM Revenue Growth (%)	LTM EBITDA Margin	LTM Gross Margin
Average	**-**	***$3,763***	***4.6x***	***5.5x***	***17%***	***32%***	***-10%***	***67%***
Median	**-**	***$1,243***	***4.4x***	***5.3x***	***16%***	***26%***	***-6%***	***68%***
2U, Inc.	TWOU	$1,275	6.0x	7.3x	22%	36%	-17%	79%
8x8 Inc.	EGHT	$1,022	3.9x	4.5x	14%	26%	2%	73%
Adobe Systems Incorporated	ADBE	$46,857	7.8x	9.3x	20%	16%	26%	84%
Amber Road, Inc.	AMBR	$134	1.8x	2.0x	10%	4%	-34%	45%
Apigee Corporation	APIC	$237	1.6x	2.2x	32%	27%	-61%	66%
AppFolio, Inc.	APPF	$490	4.6x	6.0x	30%	57%	-16%	55%
athenahealth, Inc.	ATHN	$6,250	6.1x	7.0x	15%	23%	7%	60%
Bazaarvoice, Inc.	BV	$353	1.5x	1.5x	4%	9%	-9%	62%
Benefitfocus, Inc.	BNFT	$1,061	4.7x	5.5x	17%	35%	-24%	44%
Blackbaud Inc.	BLKB	$2,982	4.4x	5.0x	13%	13%	16%	52%
Box, Inc.	BOX	$1,702	4.2x	5.5x	29%	46%	-56%	73%
BroadSoft, Inc.	BSFT	$1,019	3.0x	3.4x	11%	29%	11%	72%
Castlight Health, Inc.	CSLT	$404	2.7x	3.4x	25%	65%	-104%	55%
Citrix Systems, Inc.	CTXS	$11,637	3.6x	3.6x	1%	4%	26%	85%
Cornerstone OnDemand, Inc.	CSOD	$1,880	4.6x	5.6x	21%	29%	-18%	68%
Cvent, Inc.	CVT	$1,465	6.0x	7.0x	17%	32%	0%	68%
Demandware, Inc.	DWRE	$2,034	6.6x	7.8x	18%	48%	-14%	72%
Ebix Inc.	EBIX	$1,107	4.6x	4.7x	2%	24%	37%	73%
Ellie Mae, Inc.	ELLI	$1,796	5.8x	6.7x	15%	57%	19%	67%

Company Name	Ticker	Market Cap	TEV / NTM Revenue	TEV / LTM Revenue	NTM Revenue Growth (%)	LTM Revenue Growth (%)	LTM EBITDA Margin	LTM Gross Margin
FireEye, Inc.	FEYE	$3,330	3.7x	4.6x	22%	46%	-64%	63%
Five9, Inc.	FIVN	$439	3.0x	3.3x	10%	25%	-11%	54%
Fleetmatics Group PLC	FLTX	$1,960	5.5x	6.3x	15%	23%	24%	74%
Halogen Software Inc.	HGN	$157	1.5x	1.6x	9%	16%	-6%	74%
Healthstream Inc.	HSTM	$696	2.4x	2.6x	9%	22%	12%	57%
Hortonworks, Inc.	HDP	$1,012	5.4x	7.4x	38%	165%	-143%	55%
HubSpot, Inc.	HUBS	$1,920	8.1x	10.0x	23%	57%	-24%	74%
inContact, Inc.	SAAS	$588	2.3x	2.5x	12%	29%	-1%	51%
IntraLinks Holdings, Inc.	IL	$523	1.9x	2.0x	5%	8%	3%	72%
Jive Software, Inc.	JIVE	$310	1.0x	1.0x	4%	10%	-11%	63%
K12, Inc.	LRN	$343	0.3x	0.3x	-6%	-3%	5%	37%
LivePerson Inc.	LPSN	$387	1.4x	1.4x	6%	14%	7%	71%
LogMeIn, Inc.	LOGM	$1,682	4.6x	5.3x	14%	22%	13%	87%
Marin Software Incorporated	MRIN	$133	0.9x	0.9x	2%	9%	-19%	63%
Marketo, Inc.	MKTO	$1,243	4.4x	5.4x	24%	40%	-27%	66%
Medidata Solutions, Inc.	MDSO	$2,729	5.9x	6.9x	15%	17%	10%	77%
MicroStrategy Inc.	MSTR	$2,038	2.9x	3.0x	4%	-9%	28%	81%
MINDBODY, Inc.	MB	$593	4.1x	5.0x	23%	45%	-28%	63%
NetSuite Inc.	N	$6,726	7.4x	9.0x	21%	33%	-8%	67%
New Relic, Inc.	NEWR	$1,774	7.8x	9.8x	25%	67%	-33%	79%
OPOWER, Inc.	OPWR	$547	2.8x	3.2x	13%	16%	-27%	62%
Qlik Technologies, Inc.	QLIK	$2,945	3.8x	4.3x	12%	10%	1%	85%
Quality Systems Inc.	QSII	$981	1.7x	1.8x	4%	3%	12%	55%
Qualys, Inc.	QLYS	$1,132	5.0x	5.8x	16%	23%	24%	79%
RealPage, Inc.	RP	$1,760	3.5x	3.8x	9%	16%	11%	58%
RingCentral, Inc.	RNG	$1,673	4.5x	5.3x	17%	35%	-6%	71%
salesforce.com, inc.	CRM	$52,058	6.8x	8.4x	22%	24%	6%	75%
SciQuest, Inc.	SQI	$361	2.0x	2.1x	4%	3%	8%	68%
ServiceNow, Inc.	NOW	$13,763	10.6x	13.4x	26%	47%	-11%	67%
Shopify Inc.	SHOP	$1,971	6.9x	8.7x	27%	95%	-6%	54%
Splunk, Inc.	SPLK	$7,628	8.4x	11.2x	33%	48%	-42%	83%
SPS Commerce, Inc.	SPSC	$1,167	5.8x	6.6x	14%	24%	10%	68%
Tableau Software, Inc.	DATA	$6,825	7.5x	9.3x	24%	58%	-4%	89%
Tangoe, Inc.	TNGO	$331	1.3x	1.4x	5%	6%	4%	54%
Textura Corporation	TXTR	$563	4.6x	5.6x	22%	38%	-9%	82%
The Ultimate Software Group, Inc.	ULTI	$5,602	7.6x	8.9x	17%	22%	10%	61%
Trakm8 Holdings PLC	TRAK	$107	4.1x	5.2x	26%	40%	14%	46%
Upland Software, Inc.	UPLD	$110	1.5x	1.5x	3%	8%	1%	62%
Veeva Systems Inc.	VEEV	$3,837	7.3x	9.2x	26%	32%	24%	65%

Company Name	Ticker	Market Cap	TEV / NTM Revenue	TEV / LTM Revenue	NTM Revenue Growth (%)	LTM Revenue Growth (%)	LTM EBITDA Margin	LTM Gross Margin
Workday, Inc.	WDAY	$15,458	9.8x	13.2x	35%	51%	-16%	68%
Workiva Inc.	WK	$717	3.9x	4.5x	16%	29%	-27%	72%
Xactly Corporation	XTLY	$249	2.4x	3.0x	24%	21%	-20%	59%
Xero Limited.	XRO	$2,682	11.8x	15.5x	32%	75%	-59%	77%
Zendesk, Inc.	ZEN	$2,345	7.7x	9.9x	28%	64%	-33%	68%