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TRIVARIATE RESEARCH

SEMICONDUCTORS AND SOFTWARE: THE REVENUE AND MARGIN PLAYBOOK

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RESEARCH SUMMARY

Most of our recent research has led us to believe that gross margin expansion above consensus expectations is crucial for success at this point in the cycle and has been important for identifying compounders over the last decade. Back on October 1, 2002, we initiated as the US Semiconductor analyst at Sanford C. Bernstein & Co, with a note title “Share Gainers and Margin Expanders Are Multiple Expanders”. Nineteen years later we wanted to research the relevance of share gain and margin expansion in software and semis to identify dislocated stocks that may signal an investment opportunity.

There is clearly some tension in the market on these key areas of technology, with high options activity and recent volatility reflecting supply chain concerns, etc. Going “back to the basics” of revenue growth vs. peers and margin expansion seems timely today. As such, we split each sector into high and low gross margin peer groups to account for substantial business model differences and searched for investment opportunities

Semiconductors: Gross margin expansion is more important than share gain for both high and low gross margin chip makers. Multiple expansion / contraction and price momentum help us further refine the stock ideas. **Long and short ideas are shown on page 7.**

Software: Revenue growth matters more than gross margin expansion among high gross margin companies. The only thing that matters for low gross margin software companies is improving gross margins. **Long and short ideas are shown on page 12.**

SEMIS AND SOFTWARE: THE REVENUE AND MARGIN PLAYBOOK

Semiconductors Playbook

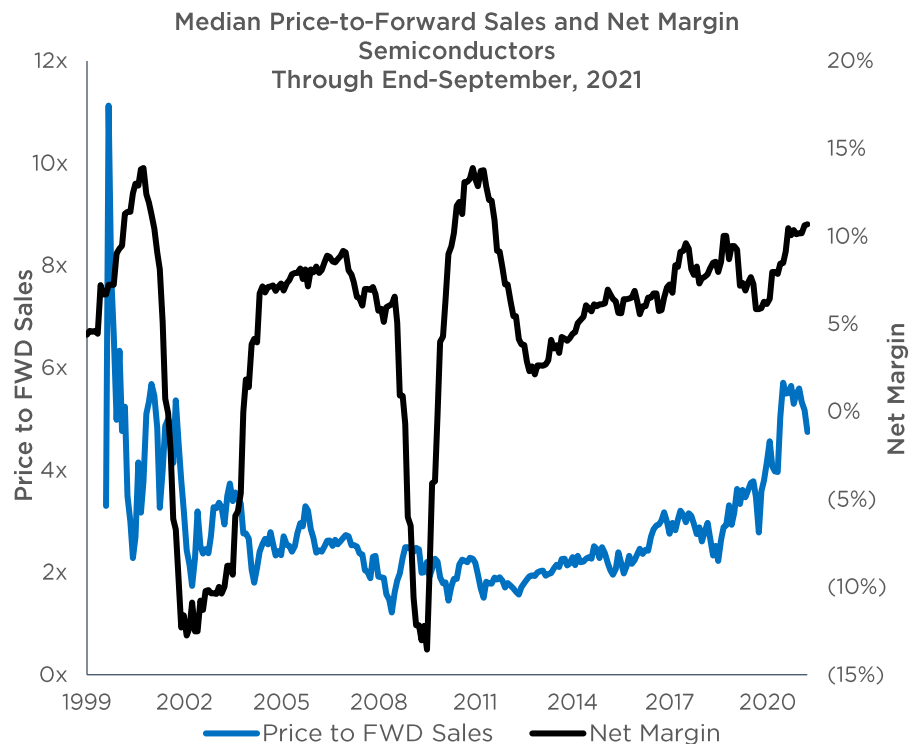
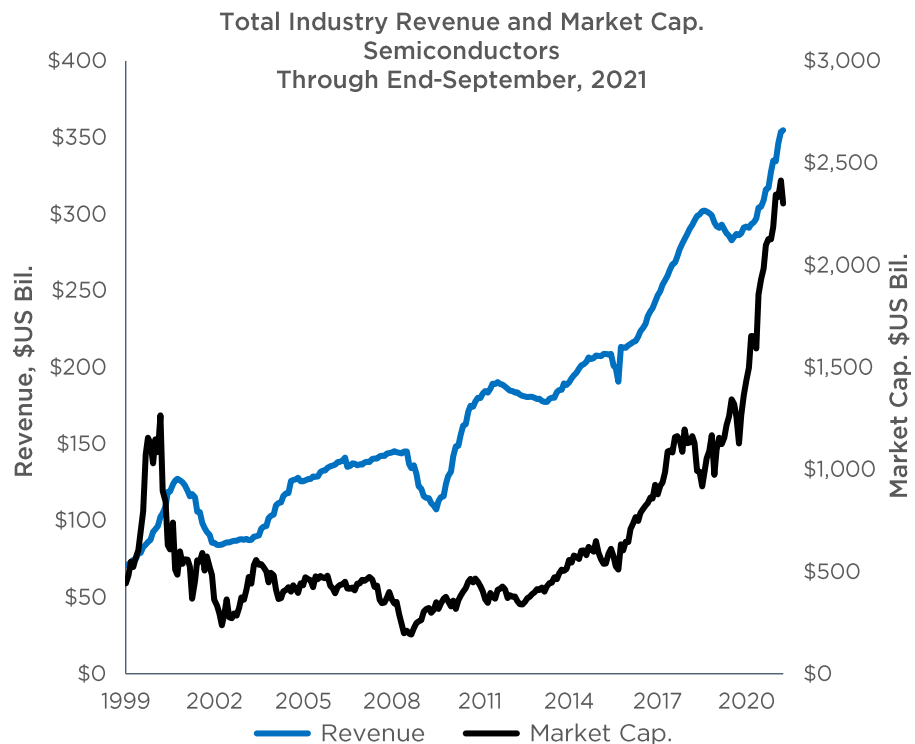
High Current Goss Margins				Low Current Goss Margins			
Relative Forecast Gross Margin	Relative Forecast Revenue	Relative 3-Month Price-to-Forecast-Sales	Relative 3-Month Price Momentum	Relative Forecast Gross Margin	Relative Forecast Revenue	Relative 3-Month Price-to-Forecast-Sales	Relative 3-Month Price Momentum
Expansion	Share Gain	Expansion	Positive	Expansion	Share Gain	Expansion	Positive
Expansion	Share Gain	Expansion	Negative	Expansion	Share Gain	Expansion	Negative
Expansion	Share Gain	Contraction	Positive	Expansion	Share Gain	Contraction	Positive
Expansion	Share Gain	Contraction	Negative	Expansion	Share Gain	Contraction	Negative
Expansion	Share Loss	Expansion	Positive	Expansion	Share Loss	Expansion	Positive
Expansion	Share Loss	Expansion	Negative	Expansion	Share Loss	Expansion	Negative
Expansion	Share Loss	Contraction	Positive	Expansion	Share Loss	Contraction	Positive
Expansion	Share Loss	Contraction	Negative	Expansion	Share Loss	Contraction	Negative
Contraction	Share Gain	Expansion	Positive	Contraction	Share Gain	Expansion	Positive
Contraction	Share Gain	Expansion	Negative	Contraction	Share Gain	Expansion	Negative
Contraction	Share Gain	Contraction	Positive	Contraction	Share Gain	Contraction	Positive
Contraction	Share Gain	Contraction	Negative	Contraction	Share Gain	Contraction	Negative
Contraction	Share Loss	Expansion	Positive	Contraction	Share Loss	Expansion	Positive
Contraction	Share Loss	Expansion	Negative	Contraction	Share Loss	Expansion	Negative
Contraction	Share Loss	Contraction	Positive	Contraction	Share Loss	Contraction	Positive
Contraction	Share Loss	Contraction	Negative	Contraction	Share Loss	Contraction	Negative

Software Playbook

High Current Goss Margins				Low Current Goss Margins			
Relative Forecast Gross Margin	Relative Forecast Revenue	Relative 3-Month Price-to-Forecast-Sales	Relative 3-Month Price Momentum	Relative Forecast Gross Margin	Relative Forecast Revenue	Relative 3-Month Price-to-Forecast-Sales	Relative 3-Month Price Momentum
Expansion	Share Gain	Expansion	Positive	Expansion	Share Gain	Expansion	Positive
Expansion	Share Gain	Expansion	Negative	Expansion	Share Gain	Expansion	Negative
Expansion	Share Gain	Contraction	Positive	Expansion	Share Gain	Contraction	Positive
Expansion	Share Gain	Contraction	Negative	Expansion	Share Gain	Contraction	Negative
Expansion	Share Loss	Expansion	Positive	Expansion	Share Loss	Expansion	Positive
Expansion	Share Loss	Expansion	Negative	Expansion	Share Loss	Expansion	Negative
Expansion	Share Loss	Contraction	Positive	Expansion	Share Loss	Contraction	Positive
Expansion	Share Loss	Contraction	Negative	Expansion	Share Loss	Contraction	Negative
Contraction	Share Gain	Expansion	Positive	Contraction	Share Gain	Expansion	Positive
Contraction	Share Gain	Expansion	Negative	Contraction	Share Gain	Expansion	Negative
Contraction	Share Gain	Contraction	Positive	Contraction	Share Gain	Contraction	Positive
Contraction	Share Gain	Contraction	Negative	Contraction	Share Gain	Contraction	Negative
Contraction	Share Loss	Expansion	Positive	Contraction	Share Loss	Expansion	Positive
Contraction	Share Loss	Expansion	Negative	Contraction	Share Loss	Expansion	Negative
Contraction	Share Loss	Contraction	Positive	Contraction	Share Loss	Contraction	Positive
Contraction	Share Loss	Contraction	Negative	Contraction	Share Loss	Contraction	Negative

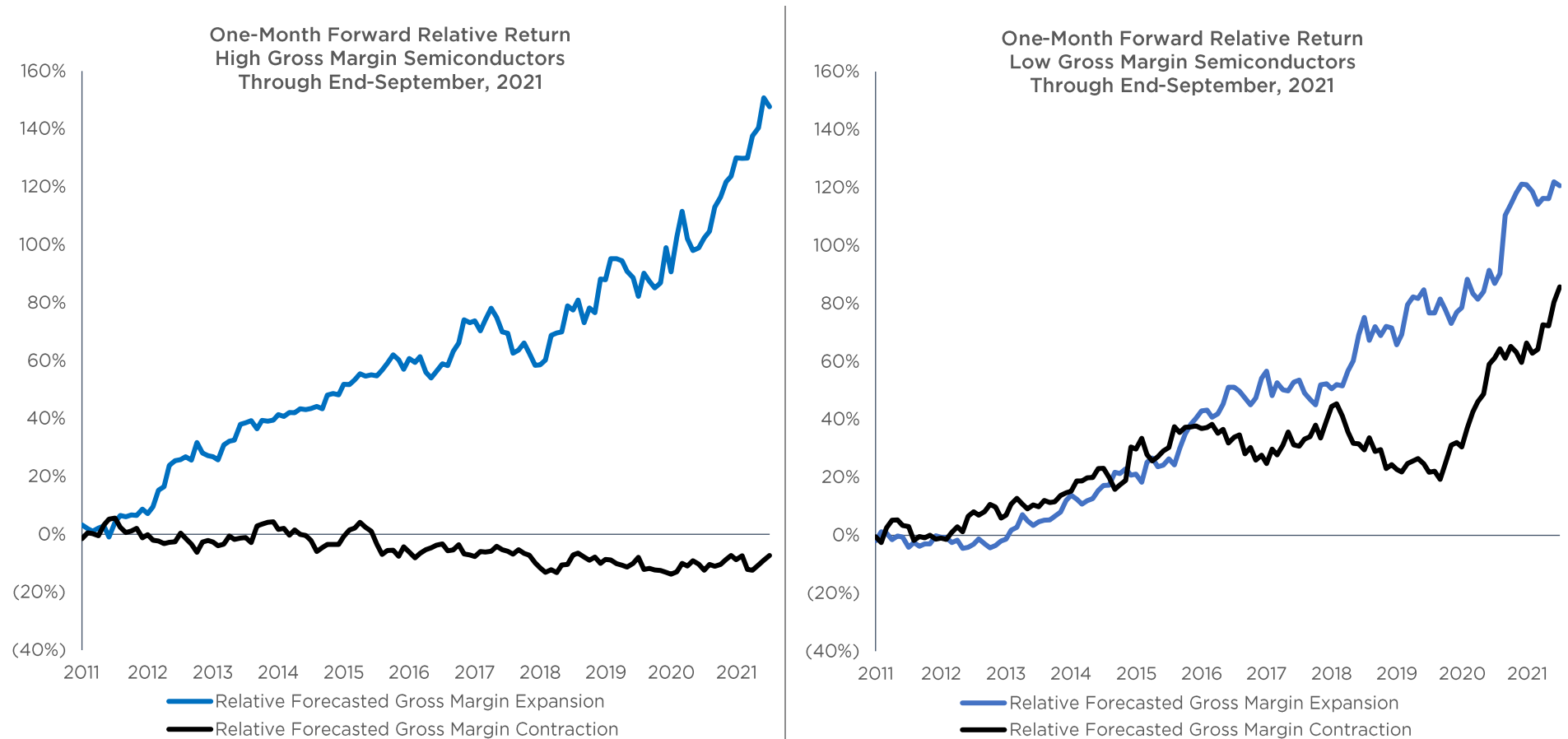
SEMICONDUCTOR INDUSTRY VALUATION HAS EXPANDED

The semiconductor industry has grown revenue nearly seven-fold since the TMT bubble burst, with down cycles post the financial crisis, a short-lived one in 2016, and during COVID (left chart). The market has begun to reward the industry with disproportionately higher multiples, driving the industry to near \$2.5 trillion in market value today. Multiples expanded from 2x to nearly 5x forward sales in the last seven years as the industry's trough net margins were 5% during COVID vs. nearly negative 10% in 2001 and 2009 (right chart)



FORECASTED GROSS MARGINS IS THE KEY FOR SEMIS

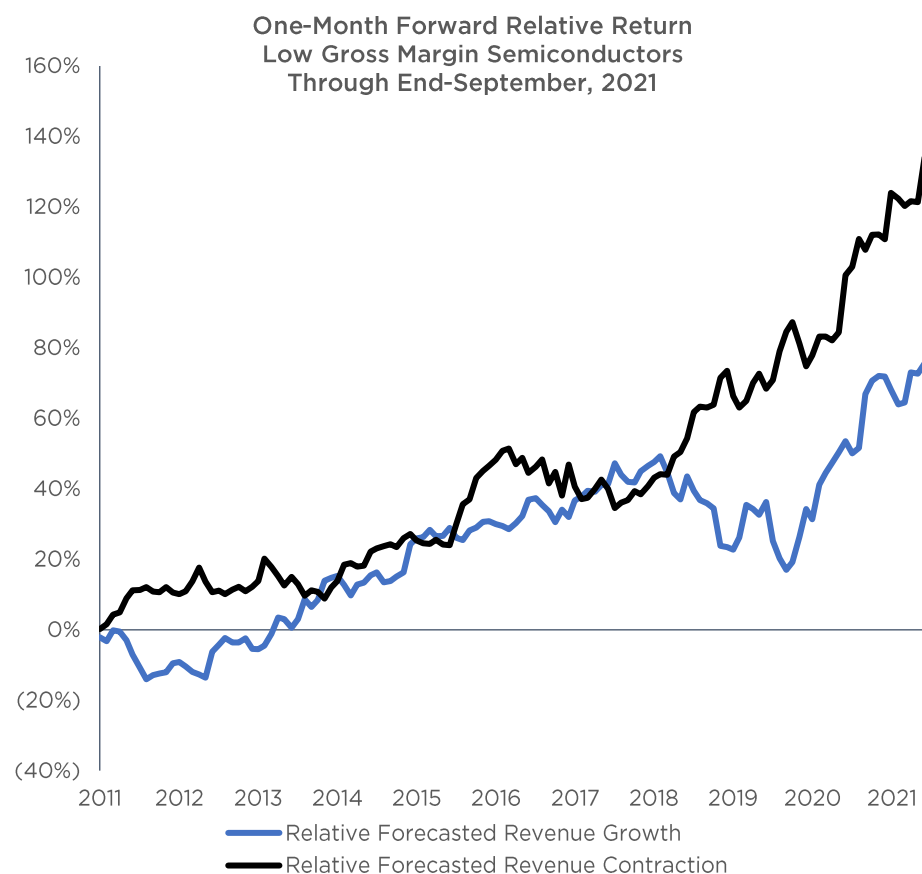
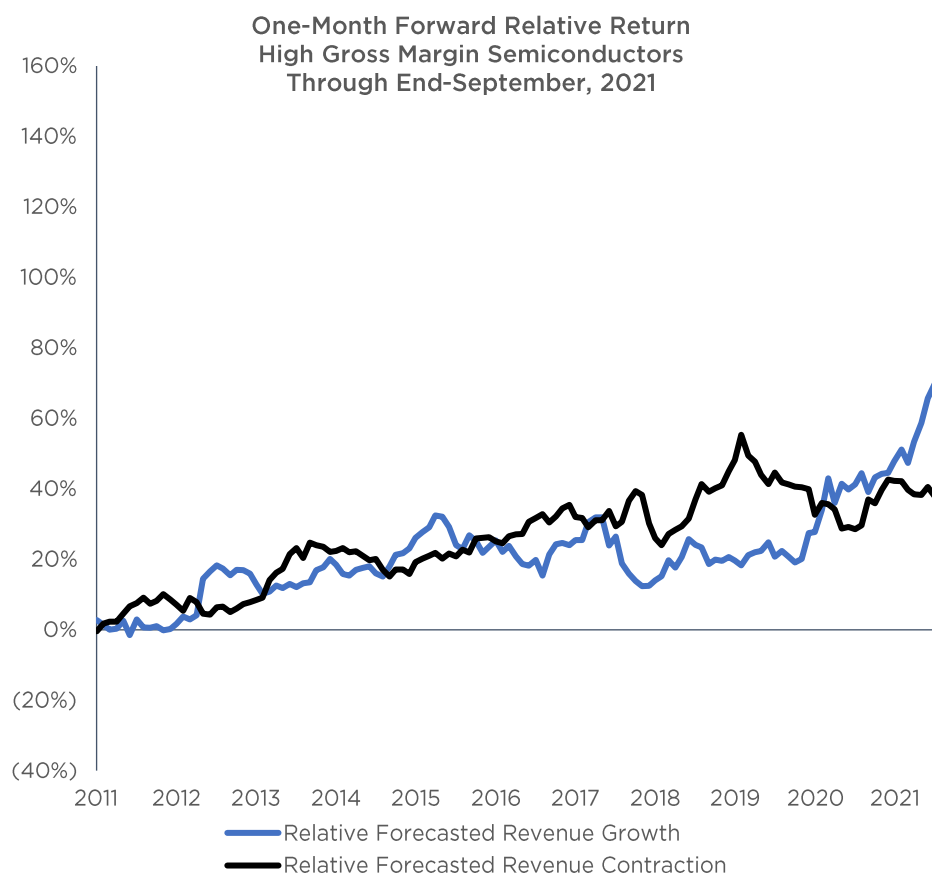
We analyzed the semiconductor stocks and evaluated the subsequent stock performance of those companies that are forecasted to expand their margins faster / slower than average among the higher gross margin companies (left chart) and low gross margin companies (right chart). In both cases, forecasted margin expanders perform better, but margin contraction was punished among the high margin companies



Note: We present one-month forward returns here, but studied multiple performance horizons, and conclusions were validated on longer performance horizons.

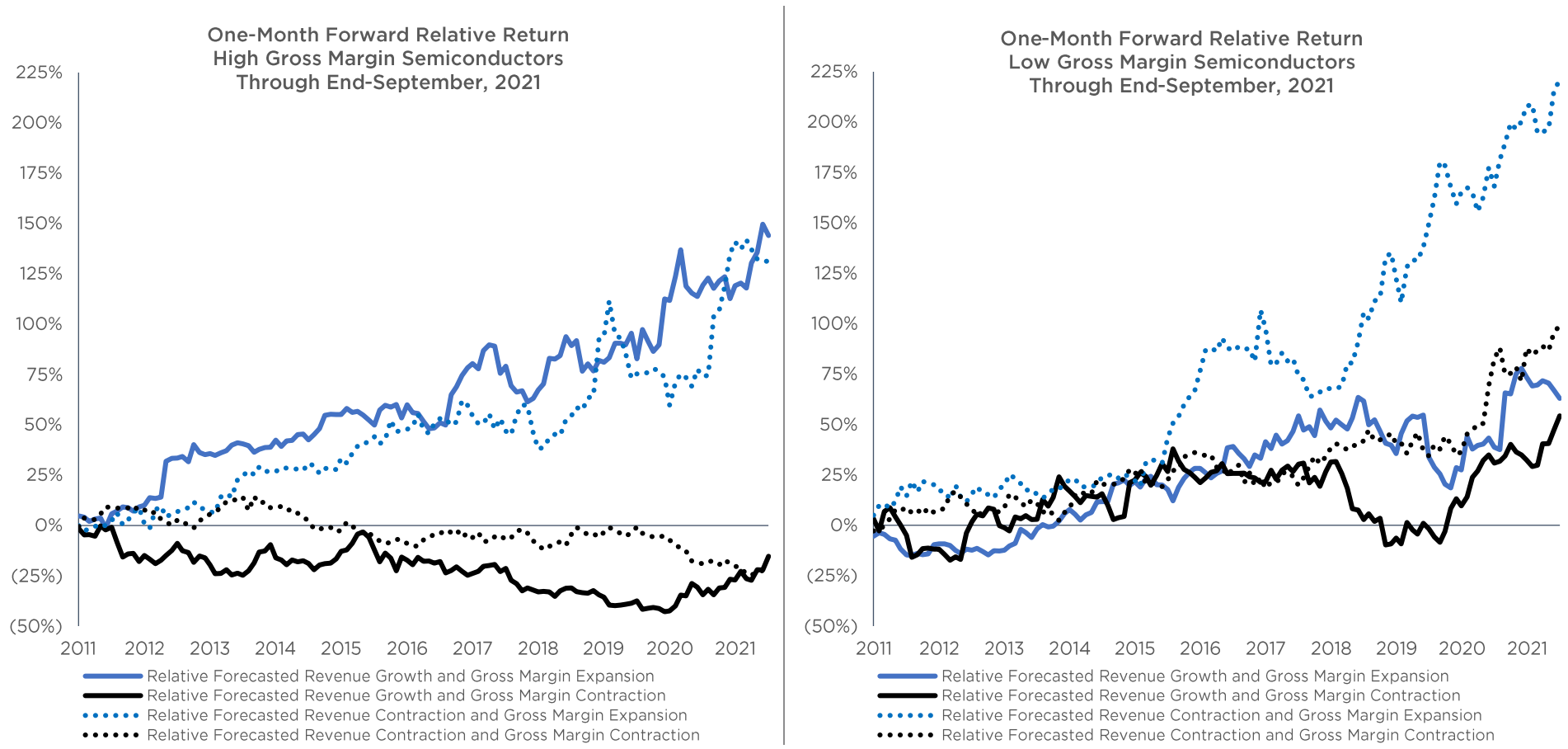
FORECASTED RELATIVE REVENUE GROWTH MATTERS LESS FOR SEMIS

We also investigated high and low gross margin semiconductors to see if share gain / share loss matters. Forecasted share gain or share loss did not materially impact subsequent performance much among the high gross margin semis (left chart). Among low gross margin companies, forecasted share loss has outperformed forecasted share gain, potentially because estimate achievability was easier, and high expectations are often punished in chip stocks



MARGIN EXPANSION MORE IMPORTANT THAN SHARE GAIN FOR CHIPS

Combining share gain / loss and margin expansion / contraction, we notice that among high margin semis (left chart) margin contraction is punished, independent of the forecasted revenue outlook, and margin expansion is rewarded. For low margin chip makers (right chart), forecasted share loss and gross margin expansion yields by far the best return – meaning the market wants low margin companies to chase higher margin revenue and improve their mix



SEMICONDUCTOR STOCK IDEAS

High margin semis that are forecasted to have continued margin expansion and have recently lagged and seen multiple contraction subsequently perform best (stocks buy, top of left table). High margin semi short ideas with poor momentum continue to be weak (bottom left table). For low gross margin semis, buying stocks with good recent price momentum and forecasted margin expansion is best (top of right table). Low margin semis with poor momentum continue to lag (bottom right)

High Gross Margin Semiconductors

Buy Relative Gross Margin Growers, Multiple Contraction, and Low Momentum
Sell Relative Gross Margin Shrinkers, and Low Momentum
End-September, 2021

Long		
Ticker	Company Name	Market Cap (\$ US. Bil)
NXPI	NXP Semiconductors N.V.	51.93
SWKS	Skyworks Solutions, Inc.	27.20
QRVO	Qorvo, Inc.	18.58
ONTO	Onto Innovation Inc.	3.56
Short		
INTC	Intel Corporation	216.16
TXN	Texas Instruments Incorporated	177.45
QCOM	QUALCOMM Incorporated	145.49
TER	Teradyne, Inc.	18.01
OLED	Universal Display Corporation	8.06
SLAB	Silicon Laboratories Inc.	5.71
CRUS	Cirrus Logic, Inc.	4.74
RMBS	Rambus Inc.	2.42
CEVA	CEVA, Inc.	0.98

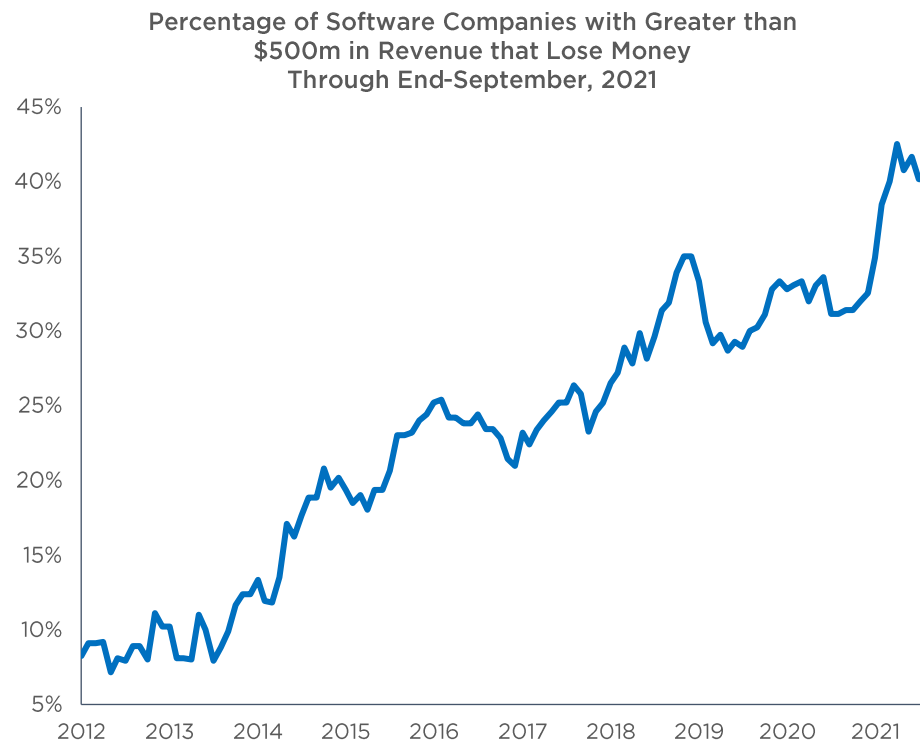
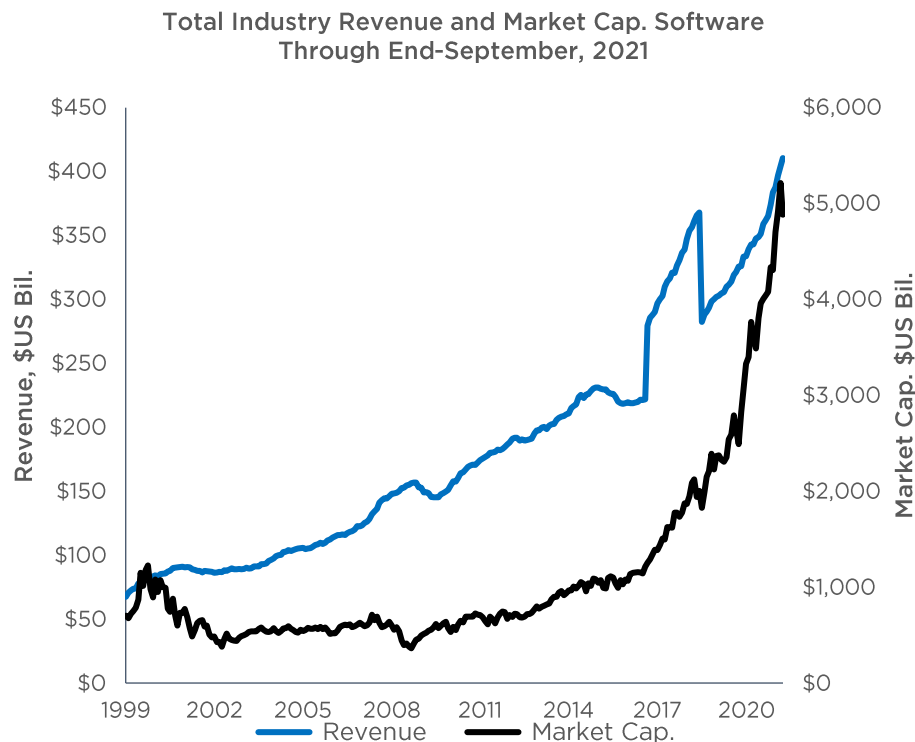
Low Gross Margin Semiconductors

Buy Relative Gross Margin Growers with Lower Revenue Growth Expectations, Multiple Expansion, and High Momentum
Sell Relative Gross Margin Shrinkers with Higher Revenue Growth Expectations, and Low Momentum
End-September, 2021

Long		
Ticker	Company Name	Market Cap (\$ US. Bil)
ON	ON Semiconductor Corporation	19.71
SYNA	Synaptics Incorporated	7.03
TSEM	Tower Semiconductor Ltd.	3.24
FORM	FormFactor, Inc.	2.90
PLAB	Photronics, Inc.	0.83
AOSL	Alpha and Omega Semiconductor Limited	0.83
Short		
AMAT	Applied Materials, Inc.	116.23
LRCX	Lam Research Corporation	80.14
ENPH	Enphase Energy, Inc.	20.19
SEDG	SolarEdge Technologies, Inc.	13.86
KLIC	Kulicke and Soffa Industries, Inc.	3.61

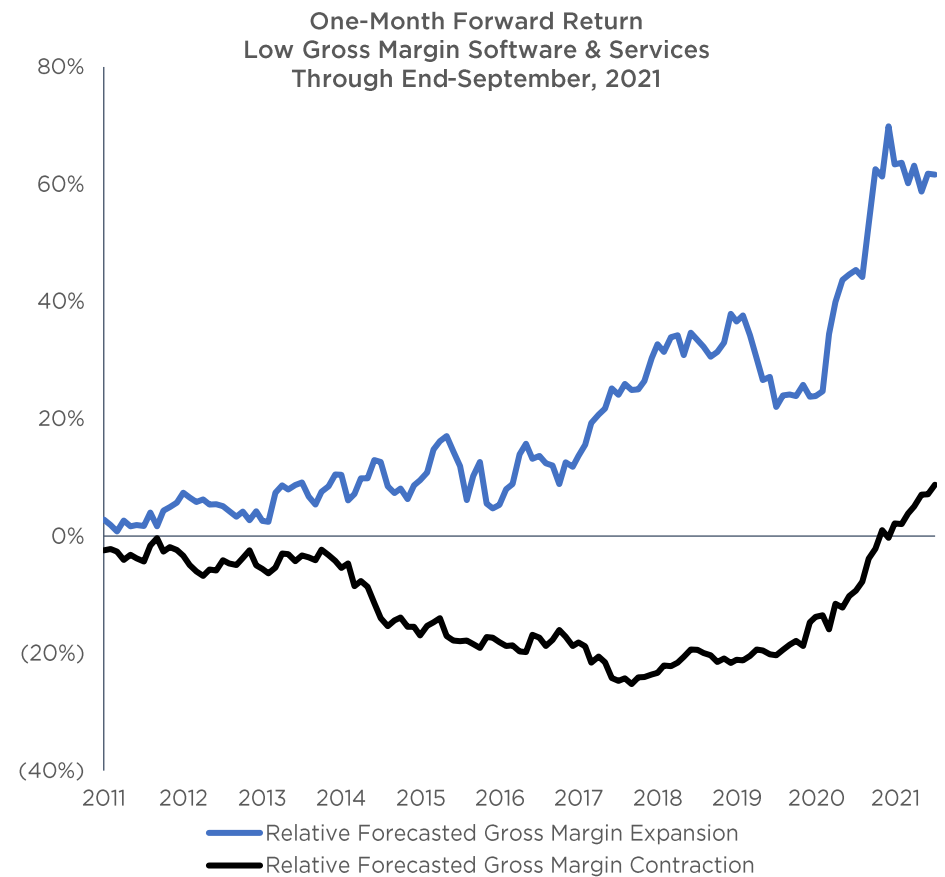
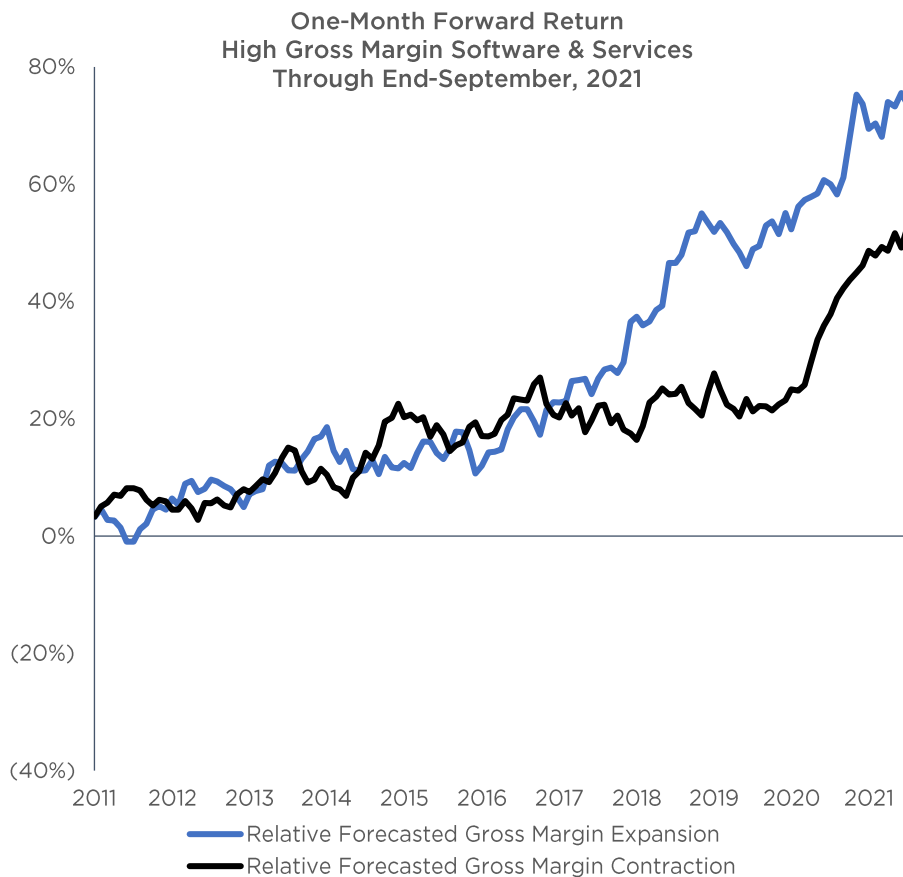
SOFTWARE WORKED DESPITE LACK OF CURRENT PROFITABILITY

The software universe has expanded its revenue eight-fold and market capitalization by 14.5x since the financial crisis (left chart). But current profitability seems to matter less to investors, as over 40% of software companies with more than \$500 million in revenue lose money today (right chart), up from 6% less than ten years ago. This is in part the case because these companies maintain their growth status for longer, with more recurring revenue, and in part the case because acquirors view their gross profit line as the benchmark, not their net profit line



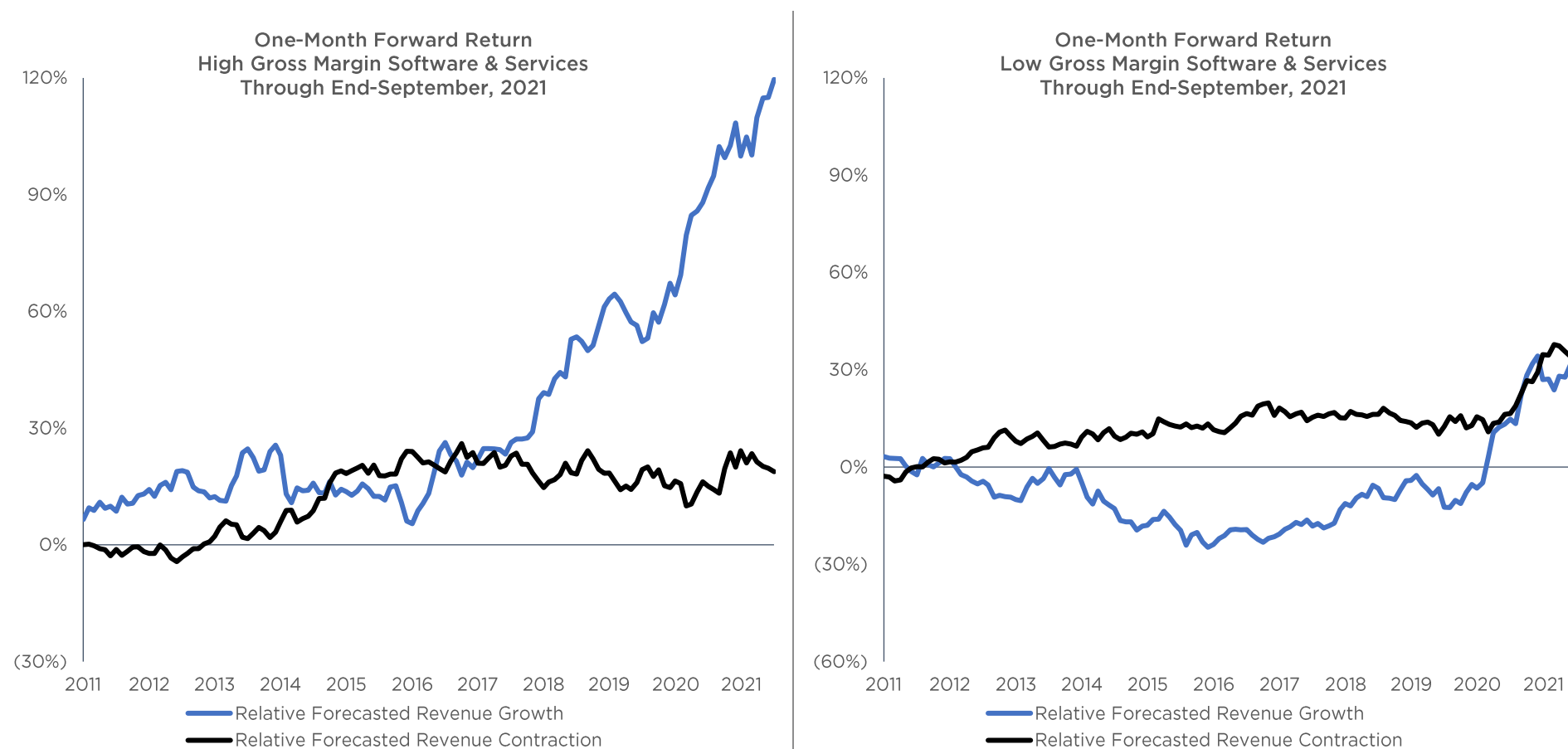
MARGIN EXPANSION MATTERS ONLY FOR LOW MARGIN SOFTWARE

Among high margin software companies (left chart), forecasted gross margin expansion performs better than forecasted margin contraction, though the overall difference is not substantial and most of the relative outperformance was derived since 2017. Among low margin software companies (right chart), forecasted margin expansion was better than forecasted contraction



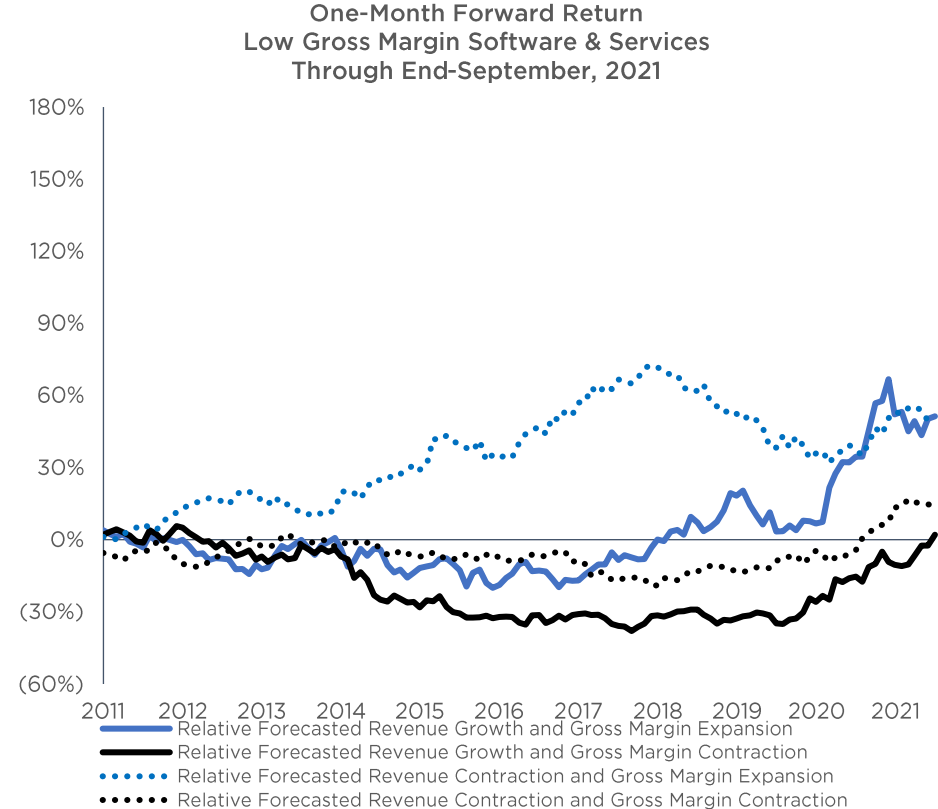
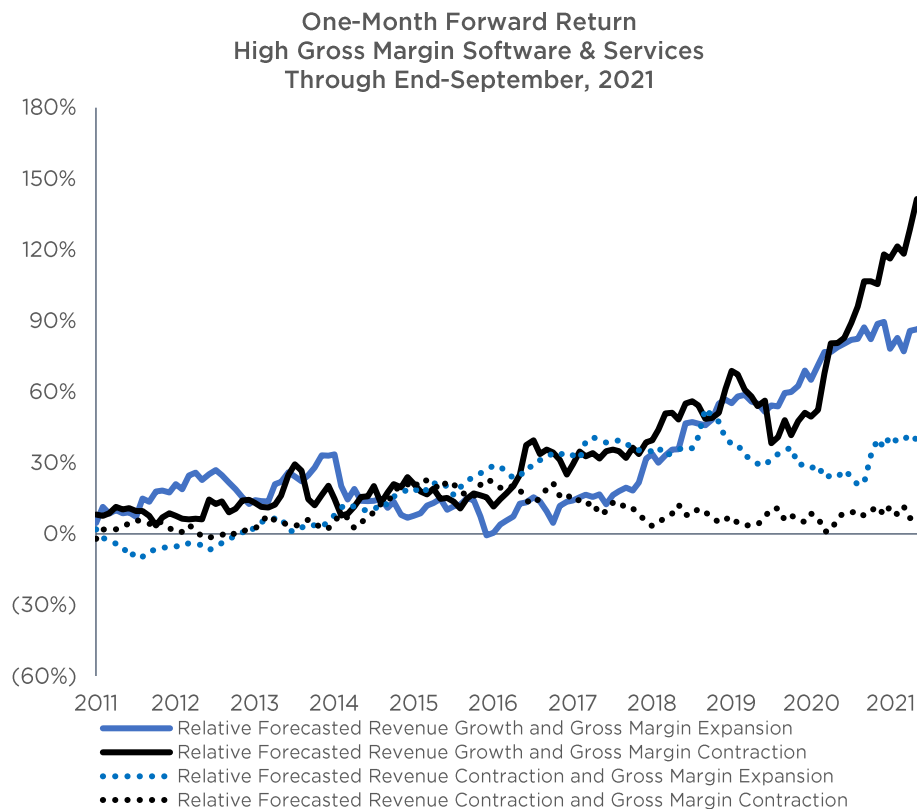
SHARE GAIN IS IMPORTANT FOR HIGH MARGIN SOFTWARE

For high gross margin software companies, it is extremely important for forecasted revenue growth to be faster than average (left chart), with strong outperformance for share gainers among the high margin software companies relative to those high margin software companies forecasted to be share losers. Low gross margin software companies are generally weak stocks, whether forecasted revenue is high or low (right chart)



SHARE FOR HIGH MARGIN, MARGIN EXPANSION FOR LOW MARGIN

Among high gross margin software companies, forecasted high revenue growth is best, with share gain and forecasted margin contraction historically outperforming forecasted share gain and margin expansion (left chart). Among low gross margin software companies, forecasted margin expansion is more important than revenue growth (right chart) as software companies need to have higher profit margin to get higher multiples



SOFTWARE STOCK IDEAS

For high gross margin software, stocks that have strong price momentum, but multiple contraction are buys (top left). Shorts are high margin software with strong momentum that are also seeing multiple expansion, as the sales growth is not offsetting the change in valuation (bottom left). Among low gross margin software, buys have good momentum and multiple expansion, the opposite of high margin (top right), and sells have high momentum

High Gross Margin Software

Buy Relative Share Gainers, Multiple Contraction, and High Momentum
Sell Relative Share Losers, Multiple Expansion, and High Momentum
End-September, 2021

Long		
Ticker	Company Name	Market Cap (\$ US. Bil)
ADBE	Adobe Inc.	273.93
CRWD	CrowdStrike Holdings, Inc.	56.09
OKTA	Okta, Inc.	36.71
NET	Cloudflare, Inc.	35.20
AVLR	Avalara, Inc.	15.09
BL	BlackLine, Inc.	6.90
VRNS	Varonis Systems, Inc.	6.51
Short		
ORCL	Oracle Corporation	238.19
INTU	Intuit Inc.	147.34
SNPS	Synopsys, Inc.	45.66
CDNS	Cadence Design Systems, Inc.	41.92
NTNX	Nutanix, Inc.	8.08
JCOM	Ziff Davis, Inc.	6.59
CYBR	CyberArk Software Ltd.	6.27
ALTR	Altair Engineering Inc.	5.41

Low Gross Margin Software

Buy Relative Gross Margin Growers, Multiple Expansion, and High Momentum
Sell Relative Gross Margin Shrinkers, High Momentum
End-September, 2021

Long		
Ticker	Company Name	Market Cap (\$ US. Bil)
SNOW	Snowflake Inc.	91.00
MDB	MongoDB, Inc.	31.20
PCTY	Paylocity Holding Corporation	15.31
JKHY	Jack Henry & Associates, Inc.	12.14
GWRE	Guidewire Software, Inc.	9.88
NCNO	nCino, Inc.	6.83
RPD	Rapid7, Inc.	6.30
DCT	Duck Creek Technologies, Inc.	5.83
EVBG	Everbridge, Inc.	5.80
SPSC	SPS Commerce, Inc.	5.78
Short		
MSFT	Microsoft Corporation	2118.60
EPAM	EPAM Systems, Inc.	32.31
CDAY	Ceridian HCM Holding Inc.	16.88
TDC	Teradata Corporation	6.26

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