Krause Fund Research

Fall 2023 November 14, 2023

Stock Rating:	Target Range:	Current Price:
SELL	$112 – $137	$147.19

Analysts

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Investment Thesis

We recommend a **SELL** rating for TXN. Potential revenue losses reach 50% instantly should the United States ban the export of semiconductors to China. Despite TXN being a leader in the semiconductor industry, the current market price is still overvalued. Overly positive outcomes of the trade war with China are skewing analysts' predictions. Unfounded optimism leads to overvaluation.

Drivers of Thesis

- We forecast revenue from China to decrease by 20% for the next two years due to the current trade war. Over half of TXN's revenue comes from China sales and the market has not priced in a possible decline.
- TXN focuses on chips for industrial and automotive applications. The high revenue growth associated with artificial intelligence does not apply to TXN because they do not produce this type of semiconductor. We project future growth at 4.2% instead of higher analyst expectations.
- TXN has slowed down manufacturing factories to avoid overproduction. Around half of TXN regions have been weak this quarter. We forecasted a 2.5% revenue decline for all regions in 2023 because of this trend.

Risks to Thesis

- TXN keeps 74% of its manufacturing domestic. They can capitalize on the $280 billion that the United States is using to incentivize domestic manufacturing raising US semiconductor profit margins.
- Semiconductors are constantly being used in more products with the advent of the Internet of Things and electric vehicles. Consumers are demanding more low-tech chips in the products that they purchase.
- TXN has a diversified customer base that is spread across 6 sectors and 35 individual industries. This gives their revenue stability.

1 Year Stock performance Vs Semiconductor Sector and S&P 500

Data from [34]

Company Information

Company:	*Texas Instruments Inc.*
Sector:	*Technology*
Industry:	*Semiconductors*
Exchange:	*NASDAQ* [TXN]

Financial Snapshot

Model Price Projections	
DCF:	$134.01
DDM:	$114.11
Relative Valuation:	$112.20 - $196.65
Price Data	
Current Price:	$147.19
52-Week Range:	$139.48 - $188.12
YTD Performance:	(9.97)%
Key Statistics:	
Shares Outstanding:	906 M
2022 EPS:	$9.51
2023E EPS:	$7.63
P/E:	15.43x
1Y Forward P/E	19.28x
Dividend Yield:	3.197 %
Market Capitalization:	133 B
Beta:	1.15
WACC:	10.01 %
2022 Revenue:	$20.03 B
Ratios	
Profit Margin:	50.63 %
ROE:	60.02 %
ROA:	32.26 %

Company Overview

Texas Instruments Incorporated (TXN) is a semiconductor manufacturer headquartered in Dallas Texas. It conducts business in two different segments, analog and embedded processors. TXN sells its chips to a wide variety of manufacturing companies both domestically and internationally. Their core operation is development production and sales of their semiconductors. TXN have focused their growth on domestic manufacturing.

Company Analysis

Company Overview:

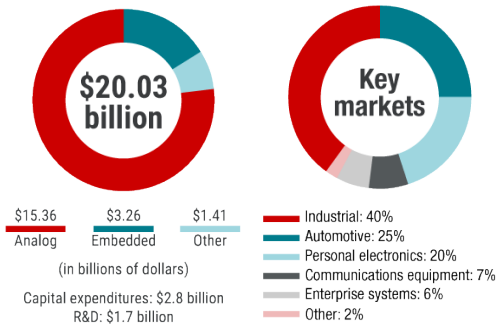
Texas Instruments Incorporated is a leading producer of of semiconductor chips, headquartered in Dallas, Texas. They supply the world with leading power-level control chips. TXN has 80,000+ products that aid over 100,000 customers across 35 industries to transmit data to help with their products. 85% of revenue comes from the personal electronic, industrial, and automotive sectors.

Since its inception in 1930, TXN has consistently invested in United States manufacturing facilities. TXN has grown to a global corporation of over 33,000 employees and has 14,000 employees in America 17,000 in Asia-Pacific, and 2,000 in Europe. It now conducts its business processes worldwide, producing around 40 billion chips yearly [35].

Revenue Analysis and Decomposition

Revenue Summary:
TXN's revenue in 2022 was $20.03 billion in 2022. This revenue was up 9.18% from 2021 revenue of $18.34 billion, and up 38.50% from TXN's 2021 revenue of $14.46 Billion. These revenues come from multiple geographic regions and are categorized in one of their two segment lines, analog processors, and embedded processors. 85% of TXN's revenue comes from three areas: industrial, automotive, and personal electronics. See the graph below.

Revenue Breakdown 2022



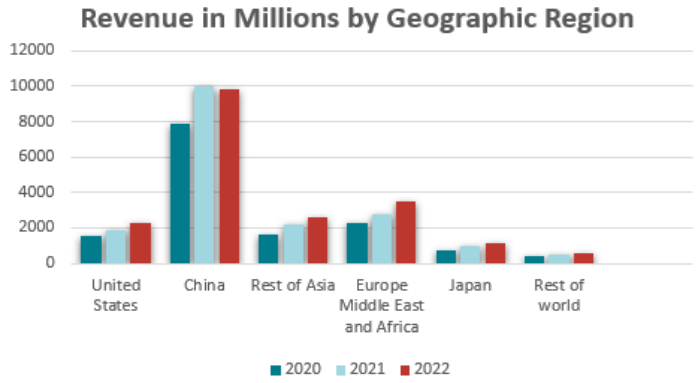
Graph from [1]

Business Segments:
TXN has 2 main business segments, embedded processors, and analog processors.

Embedded Processors:
Embedded Processors account for roughly 16% of TXN revenue. These processors are called the brains of different types of equipment. These chips are for many applications mainly related to performance power and cost relationships [2].

Analog Processors:
The bulk of TXN revenue comes from the Analog Processors computer chip segment line. This line accounted for about 77% of TXN revenue in 2022. Analog semiconductors convert real-world signals such as temperature, sound, and pressure into data to be handled by other semiconductors. Additionally, they are used to control the power in all electronic equipment [2].

Geographic Revenue Segmentation:
Geographic Market Segmentation is what we believe will be the most important factor in determining future TXN growth. This is why in our model we decided to grow our revenues by geographic regions rather than the two revenue segments Embedded and Analog Processors. The most important current trend in TXN revenue is highlighted by about 50% of TXN revenue is from sales in China [2].



Data from [2]

China Market:
In 2022 Sales to China accounted for 49% of TXN's total revenue. Projecting future China sales is a significant driving factor for the future revenue generation and TXN success. In our 7-year forecast of sales to China we considered the worsening relations between China and the United States. Due to current geopolitical developments we decided to decrease sales to China by 20% the following two years. This threat can be further seen by recent administrative actions by the US government. On Oct. 17th, 2023, the Biden Administration banned sales of advanced

semiconductors that can help the growth of China's AI development [3]. Although this is not currently affecting TXN because most of their chips are not related to AI development, we are worried that this geopolitical development will continue to worsen and spill into TXN chips in the future. Current analysts have noted this issue but continue to project China sales to be marginally impacted. We disagree with these analysts and believe there is a strong possibility that chip bans will spill into TXN chips.

US Market & Others:

The change in growth in the last two years has been strong. From 2020 to 2021 the growth of US TXN revenue was 23% and from 2021 to 2022 was 18% [2]. This growth was due to a strong demand for chips after the Covid-19 pandemic, and with current speculation from the TXN board of directors and turbulent economic markets we do not believe this is a reasonable outlook for the following years. Due to this in our model we lowered US growth to 5.5% for the 2023 and 2024 estimated years. There were similar trends in growth in the rest of Asia, Europe, the Middle East, Africa, and Japan so we expect these to be lower in the following years. TXN governance also does not believe that these high revenues will remain constant too and believes revenues will be lower the next quarters as per their Q3 earnings call on October 24th, 2023 [4]. Due to these instances in our financial model, we lowered growth rates accordingly for our 7 forecasted years.

Trade War Consequences

Trade War Summary:

The United States government is threatening to ban all semiconductor exports, causing a trade war. With China sales accounting for over 50% of TXN's revenues, TXN is at risk for significant revenue decline.

Revenue Growth or Decline Rate vs Stock Price:

Changing the growth rate of TXN's China revenue impacts TXN's stock price significantly. A 1% increase in total China revenue increased TXN's value 2.61 times as much as a similar 1% increase in U.S. revenue. The trade war has the possibility of stopping all China sales. Should this happen, TXN's revenue would be cut in half.

What if Analysis:

Even though the decrease in sales to China would likely boost United States revenue, the percent decrease in losing China sales would be catastrophic. TXN would have to increase its U.S. sales by 212.93% to maintain the same stock price. Should the trade war be resolved and China sales increase in the next year, TXN would be rated a hold.

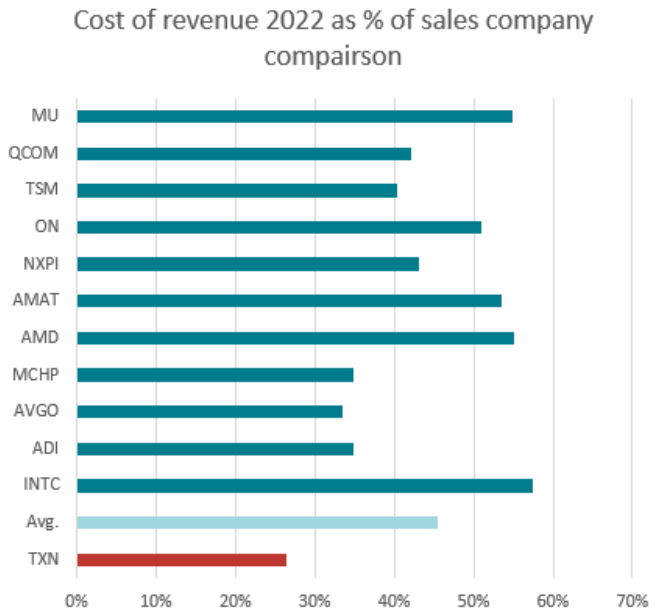
Basis for our Investment Thesis:

The basis for our investment thesis is declining China sales and the possibility of China sales going to zero. TXN is not a bad company, it has strong financials, great margins, diversified revenue sources, and a solid brand name. However even with all these positive attributes, the risk of 50% revenue loss does not justify a buy rating. There are plenty of other undervalued companies that do not share the same risk of catastrophic revenue loss that TXN currently faces.

Expense Analysis

Expense Summary:

Texas Instrument's expenses include cost of revenue, depreciation, amortization, R&D, and SG&A. Of these expenses, cost of revenue, research and development (R&D), and selling, general, and administration (SG&A) are the most significant accounting for ~44% of sales in 2022 [5].



Data from [6]

Cost of Revenue:

Texas Instruments' cost of revenue was its largest expense in recent years. This accounted for 26% in 2022, 27% in 2021, and 29% in 2020 [5]. Across the semiconductor industry cost of revenue is typically high hovering around 46%.

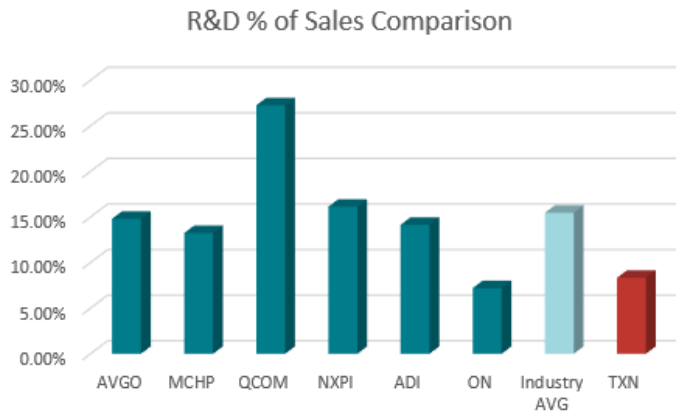
In 2022 TXN is a market leader in this category, with a cost of revenue being ~58% lower than its competitors. [6]. This can be seen in the graph above. The cost of revenue is high due to the semiconductor industry's high working capital requirements and complex equipment to produce products.

TXN has kept the cost of revenue in a consistent range for the last several years. In our model, we keep the cost of revenue constant, by taking an average of the last 7 years' cost of revenue percentage or revenue. Due to TXN being an industry leader in low-cost of revenue, it is not likely that they can decrease their current percentage further.

Research and Development:

Research and development is another main expense of Texas Instruments. In 2022 R&D accounted for 8.34% of sales [5]. R&D is a crucial part of the semiconductor industry due to high competition. If semiconductor companies have insufficient expenditure on R&D, they will quickly become obsolete.

We forecasted R&D by taking the historical average of percent of sales over the last 7 years due to the stable rates around 9-10%. It is important to note that Texas Instruments consistently invests lower percentages of sales into R&D compared to competitors. This trend of low R&D investment is a possible weakness. However, it is possible that the low-tech chips do not require the same amount of research as the cutting-edge chips. Keeping this cost low is one of the reasons that TXN has such an abnormally high-profit margin.



Data from [7]

Selling general & administrative expenses:

Sales general and administrative expenses are the last of TXN's major expenses. The 7-year historical average SG&A as a percent of sales has stayed around 10%. In our model, the forecast for SG&A is 10.78% and is multiplied by revenue to calculate the expense.

Capital Structure

Capital Summary:

TXN has had stable debt-to-equity ratios for the past several years. These ratios have consistently ranged from around 0.7 to 1.0 for the last several years. The debt-to-equity ratio was at its highest in 2020 at 1.11 but has since been trending down. While the high debts in 2020 will impact TXN's future, TXN still has a stable credit rating from Fitch, A+ [8]. TXN stands out from competitors in the rating of long-term debt see chart below. This is an example of TXN's stability and the confidence that it will not default on debt.

Debt Rating Comparison

Ticker	TXN	AVGO	AMD	INTC	QCOM	AMAT	ADI
LT debt Rating	A+	BBB-	A-	A	A	A	A-

Data from [36]

TXN in 2022 had 500 million in their current portion of long-term debt and had 3 billion in cash and cash equivalents. Due to their cash position, TXN will not be troubled by their debt obligations in the future. They will also confidently be able to pay it off without debt affecting their dividends or capital expenditures. It is important to note that their debt obligations are expected to remain relatively stable in the following years.

TXN LT Debt Schedule in Millions

Year	2023	2024	2025	2026	2027	2028	2029	2030
Dollars (m)	$500	$600	$750	$500	$500	$500	$750	$750

Data from [2]

Capital Expenditures:

Texas Instrument's capital expenditures come mostly from maintaining and expanding its property, plant, and equipment. TXN PP&E has grown substantially in the last few years. In 2020 Net PP&E was at $3.2 billion, 2021 $5.1 billion, and in 2022 it grew further to $6.9 billion [5]. TXN values its chip production capabilities and wants to gain a competitive advantage by furthering its control of chip supply.

TXN has been heavily investing in their production with a new $11 billion foundry in Utah, and another $30 billion foundry planned in Sherman Texas [9]. TXN's capital expenditures will increase substantially in the short term due to this upcoming investment. In our model, we adjusted for TXN's planned future expansion, by using the average capital expenditures of the last couple of years that were higher than historical averages and then growing them further by an inflation rate of 3.8%.

Payout Policy:

Texas Instruments has always paid dividends and has consistently increased them, as part of its commitment to repay cashflows to its shareholders. TXN has always increased its dividends yearly, and on November 14th its quarterly dividend will be raised by 5% going from $1.24 per share to $1.30 per share [10].

Due to their continued increases in dividend payments, our model adjusts the 2023 dividend to reflect this announcement calculated by the dividend paid in the last three quarters and then adds the new quarter dividend of $1.3 to get $5.02 per share.

The growth of dividends was calculated using the previous year's percentages of EPS to model future years because the growth of dividends will continue as it has in the past. TXN's current efforts to increase dividends solidify it as a leader in the semiconductor industry. The strong dividend payment makes TXN a great choice for investors looking for high dividend-paying equity within the semiconductor industry.

Dividend Yield Comparison

Ticker	TXN	AVGO	AMD	INTC	QCOM	AMAT	ADI
Dividend Yield	3.40%	1.90%	N/A	1.30%	2.50%	0.80%	1.90%

Data from [36]

S.W.O.T Analysis

Strengths:

Semiconductor chips have multiple applications across many different products. TXN specifically has high market channel integration. This means that after designing, testing, and perfecting a chip, they can sell it to multiple customers. This means that TXN does not have to do as much R&D as similar semiconductor firms that must create specific products for each customer. While TXN must tweak each chip for each application, perfecting the original chip concludes a majority of the R&D. TXN's strength is that they can design one quality semiconductor and sell it to different companies with little tweaks to serve multiple applications [11].

The Internet of Things (IoT) has exploded in popularity with increasingly more and more common appliances requiring semiconductors to function. Household appliances, automobiles, and consumer electronics use the type of chips that TXN manufactures. Consumers are demanding more daily items that integrate with technology, Texas Instruments will have an increasing number of clients requiring their chips [12].

TXN's customer base is well-diversified over multiple industries and sectors. They sell semiconductors to over 100,000+ customers spread across 6 sectors and 35 individual industries [2]. Their revenue is resilient against recessions and sector-specific risk. While TXN is concentrated in three sectors, (85% of revenue coming from industrial electronics automotive, and personal electronics sectors) these sectors are growing and are constantly innovating. Given the high expected growth of TXN's customers, customers will continue to demand more chips for their new products.

Opportunities:

25% of TXN's customer base is in the automotive sector [2]. Electric and hybrid powertrains are one of the industries under that umbrella. With the high growth expectations of electric vehicles in addition to the tailwind of tax incentives from the United States government pushing for more sustainable vehicles [14], TXN would have the opportunity to create chips for the increasing amount of electric vehicle models.

The American Chips Act provides incentives for semiconductor manufacturers to move away from foreign production. "The act provides roughly $280 billion in new funding to boost domestic research and manufacturing of semiconductors in the United States" [15] On the earnings call, TXN shared that they think that they are well positioned to take advantage of this opportunity provided by the federal government. With Texas Instruments doing over 74% of manufacturing domestically, this incentive should lower TXN's effective tax rate.

Weaknesses:

Two of the greatest risks that TXN faces are supply chain and manufacturing risks. TXN tells investors in their 10k that one of their greatest weaknesses comes from the work that they contract out [2].

TXN subcontracts a portion of their wafer fabrication, assembly, and product testing. Specifically, TXN depends on third parties to provide advanced logic manufacturing process technology development. Reliance on suppliers involves risks. TXN is not totally vertically integrated which means they must rely on other companies to do their jobs to continue building products. TXN cannot control these companies and this lack of control adds an element of risk.

TXN has slowed down manufacturing at some factories to avoid creating an excess of obsolete parts. During their earnings call TXN shares that manufacturing will continue to slow down into the fourth quarter, this trend is taking a toll on profitability. They also shared with investors that around half of TXN regions have been weak this quarter [13]. Rapid technological change in the markets we serve could contribute to shortened product life cycles and a decline in the average selling prices of our products. Because they cannot fully utilize these multibillion-dollar manufacturing facilities TXN is wasting money by owning non-revenue generating PP&E.

The last risk that TXN addressed in their earnings call is the lag time on profitability output from research and development. Projects that are commercially viable may not contribute to our operating results until at least a few years after they are completed.[13] This lag time between action and results means that sacrifices in R&D will not be felt for years down the line. With this type of company, it is a risk because you can easily increase profitability by cutting R&D and cannibalizing future cash flows.

Threats:

One single greatest threat to TXN is the growing government tension resulting in a trade war between the United States and China [16]. We forecast revenue from China to decrease by 20% for the next two years due to the current trade war with China. Current estimates are pricing and no decrease in China sales. Over half of TXN's revenue comes from China, so the current valuation of TXN stock is highly optimistic.

TXN mainly produces the chips needed for industrials and automobiles [2]. The semiconductors that they produce are lower tech relative to the new AI chips. The explosive revenue growth associated with the AI space does not apply to TXN because they are not creating products that are used in AI development. This lack of cutting-edge technology may mean that they are in the mature stage in the lifecycle of a business and heading toward a declining market.

Cybersecurity threats are becoming increasingly more complex and harder to defend against [2]. TXN holds data on customers' products and information on their own. Should their technology be attacked through various forms of hacking, their reputation as a company would be significantly tarnished. R&D is a major expense for TXN and if the information is taken that would be billions of dollars that would potentially not be used to increase revenues for TXN.

Industry Analysis

Semiconductor Industry:

The semiconductor industry is made up of multiple companies that produce chips for different applications.

For this specific report, we will focus on the semiconductor companies that produce chips for low-tech applications rather than high-powered processing for artificial intelligence. There is a clear divide between those seeing huge growth relating to the AI boom a those seeing lesser growth due to the technology not being as innovative. TXN focuses on creating reliable and affordable chips for common goods like automobiles, personal electronics, and infrastructure [2]. Firms in the semiconductor industry make money by selling their chips to manufacturers who use semiconductors in their products. Texas Instruments is no different with even its brand-name calculators being outsourced except for the semiconductor that calculates the answer.

Companies in this industry can differentiate themselves by creating a more energy-efficient and robust chip. With cultural values shifting towards companies that value ESG (environmental social governance), consumers are

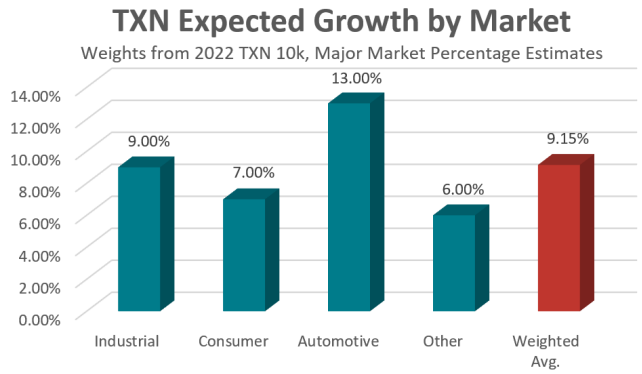
demanding that their products be energy efficient [17]. With semiconductors being an essential piece of technological advancement, profitable technology companies are becoming increasingly environmentally conscious and are looking for parts that will help them in this mission.

Industry Trends and Growth Projections:

One of the most notable and influential trends in the semiconductor industry is the dispute between the Biden Administration and the Chinese government. "By leveraging these chips' highly concentrated manufacturing pipeline the Biden administration hoped to cut off China's access to them altogether" [18].

America-based chip manufacturers are in a unique position given this new trend. While American manufacturers are perfectly positioned to provide chips to America, they will lose out on profits from China. With total American manufacturing being a little over half as large as the Chinese, this would not be as profitable as providing chips for China [19]. In 2022 TXN's China sales made up 49% of their revenues. Should the Biden Administration be successful in banning all chip sales to China, TXN value would take a substantial dip due to the significant loss of revenue.

McKinsey analysts project the semiconductor industry to grow to 1 trillion dollars by the end of the decade. CAGR could range from 6 to 8 percent a year up to 2030 [20]. We project companies' revenues in the semiconductor industry to increase due to the disproportionate growth projected in the electric vehicle sector. "Accounting for just 8 percent of semiconductor demand in 2021, the automotive industry could represent from 13 to 15 percent of demand by the end of the decade".



Data from [20]

These large growth figures expected for the semiconductor industry could have a disproportionately positive effect on Texas Instruments due to their revenue breakdown by industry. Growth estimates in the Automotive sector are supposed to grow by 13% CAGR, Industrial electronics by 9% CAGR, and Consumer electronics by 7% CAGR. With 85 percent of TXN's revenue being made up of these three sectors, they are in a strong position to grow future revenues.

Comparison to Industry and Competition:

TXN's main competitors were difficult to identify. While each company manufactures semiconductors in some fashion, the use for chip is vastly different. TXN has very few direct competitors that are attempting to capture the same market share as them. The companies that we did identify to be most competitive based on relative size and same semiconductor space were Intel Corp. (INTC), Analog Devices Inc. (ADI), Broadcom Inc. (AVGO), Microchip Technology Inc. (MCHP), Advanced Micro Devices Inc. (AMD), Applied Materials Inc. (AMAT), NXP Semiconductors Nv. (NXPI), ON Semiconductor Corp. (ON), Taiwan Semiconductor Manufacturing Co. (TSM), Qualcomm Inc. (QCOM), Micron Technology Inc. (MU).

Attached below is a table of similar-sized firms with key information on profits among each.

Company:	Market Cap ($b)	2022 Revenue ($b)	Profit Margin	Profits($b)
Broadcom	$ 395	$ 35.5	39.3	$ 13.91
Advanced Mircro Devices	$ 192	$ 22.1	0.9	$ 0.21
Intel	$ 164	$ 52.9	-3.1	$ (1.64)
Qualcomm	$ 139	$ 35.8	20.2	$ 7.23
Texas Insturments	*$ 134*	*$ 18.1*	*39.2*	*$ 7.10*
Applied Materials	$ 126	$ 26.5	24.3	$ 6.44
Analog Devices	$ 86	$ 12.8	29.2	$ 3.75

Key:
Pink: Comparable companies (Measured Market Cap and Company Profit)
Blue: Strongest Statistic of Competition
Red: Texas Insturments

Data from [6]

Analysis: TXN ties Broadcom for having the highest profit margin in the industry. While TXN lags the competition in gross revenue generated, it falls right where it should in terms of net profit for a company of similar size due to its high-profit margin.

Ticker	TXN	AMD	AVGO	ADI	AMAT	QCOM	TSM	NXPI	MCHP	ON
P/E Ratio	18.92	920.84	28.94	23.19	19.74	19.00	18.06	17.12	16.81	13.44
Stock Price	$ 147.19	$ 118.59	$ 957.52	$ 172.32	$ 150.68	$ 124.21	$ 97.44	$ 186.67	$ 77.56	$ 67.38

Data from [6]

As we look at the competitors in the semiconductor industry the ratios vary greatly. AMD's ratio of 894.82 to ON is the lowest at 12.97. (Intel and Micron Technology were left out because they did not generate profit and

therefore do not have a P/E ratio). However, there seems to be a consensus that Semiconductor companies are generally supposed to trade between 20x and 16x earnings.

Out of our competitor set Qualcomm and Applied Materials are the most comparable competitors. Each of these companies is similarly sized at around 133 billion and each of them generates a similar profit of around 7 billion. Texas Instruments being the company directly between these other two companies seems to be correctly priced when considering competitors and similar valuation.

Porter's Five Forces Analysis

Competitive Rivalry:
The Semiconductor industry is very competitive between firms. One of the biggest ways this competition shows up is in R&D spending. There is constant pressure to innovate, differentiate, and discover something new because, without differentiation in the capabilities of the semiconductors, chips would be a commodity. Most chips are specifically designed for a unique application and are not interchangeable with other devices.

Substitution between firms rarely happens because the chips are made with a specific application in mind. While the basic concept of the semiconductor is similar across companies, semiconductor firms do have to specialize their products to each customer's needs. TXN is a relatively stable company due to its vast customer base over multiple different sectors. While TXN does fight to grow market share, it would be very difficult for a second company to be competent in the number of different sectors in which TXN has built relationships.

Supplier Power:
There is only moderate supplied power since most large semiconductor companies have large amounts of excess cash. To start a semiconductor company there is a requirement to have a large amount of capital and with this large amount of capital, companies can take their time when looking around for the raw materials needed for production. Additionally, successful companies can purchase smaller raw material firms to integrate vertically. The number of raw material suppliers is vast and so if one company is not meeting demands, a different company would be more than happy to get the extra revenue that semiconductor companies provide. TXN has large cash reserves with over 3 billion in cash and cash equivalents on their balance sheet. They are in a strong position to negotiate to get great material prices.

Buyer Power:
Most buyers of semiconductors are large corporations that have minimal room for price negotiations. Buying power is even between the producer and the customer. Due to the few producers of semiconductors for each specific application, demand becomes very high when supply chain issues arise. Demand for the chips remains high due to the need and growing prevalence of electronic device integration with the world.

Threat of Substitution:
Most customers of semiconductor companies manufacture products that would be useless without the vital electronic components. Semiconductors are technologically advanced products that are costly to produce and take billions of research and development spending to create. There are no current substitutions for semiconductors currently for consumers to experiment with. No technology has been created to replace semiconductors. TXN is well positioned because the semiconductor industry itself has a competitive advantage.

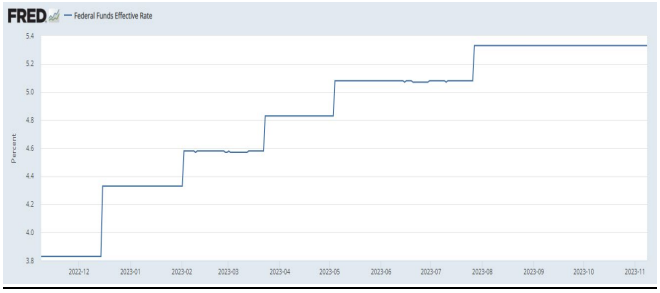
Threat of New Entrants:
There is very little threat of a new entrant to the semiconductor market. Each semiconductor manufacturing facility not only requires 15-20 billion dollars to build [21]. Additionally, the semiconductor chips themselves take years and billions of dollars of R&D to develop. TXN remarked during their earnings call that in some cases they might not realize a return on our research and development investments until at least a few years after our projects are completed [2]. This means that there is little threat to the existing players in the industry.

Economic Analysis

Interest Rates:
Interest rates are a key economic indicator for the technology industry. This is due to the technology industry requiring large amounts of capital to start up, in addition to high research and development costs. If interest rates are higher than average the companies in the industry are less likely to take out these loans to further their growth. The Federal Reserve is responsible for setting the federal funds rate. This rate is the rate that

banks lend to each other in the overnight lending market. These rates have a high degree of influence on all other interest rates. Changes in the federal funds rates will greatly affect borrowing, treasury bonds, and more. It is important to note that as of late the FED has been increasing rates to try to combat inflation [22].

Federal Funds Effective Rates



Data from [22]

The current federal funds rate is 5.33%, and within the next year, it is expected to increase again. We expect this rate to increase from 0-.50% in the next year because the government is trying to slow down inflation. This year inflation has dropped significantly from around 7.0% in 2022 to 3.2% in 2023 [23]. According to the New York Times, John C. Williams, president of the Federal Reserve Bank of New York said, "We're pretty close to what a peak rate would be" [37]. This leads us to believe that we are near the peak of where rates will be.

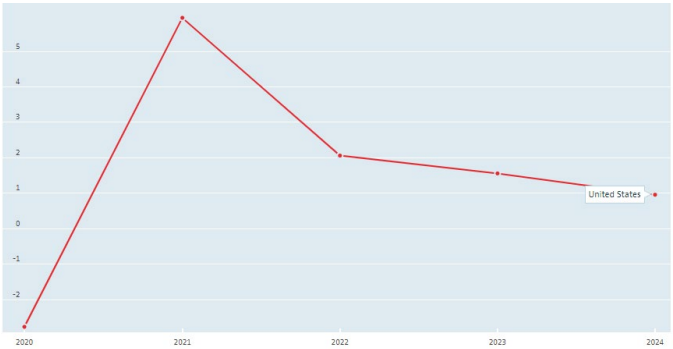
When looking at treasury yields we looked at long-term 30-year yields. In the semiconductor industry, long-term treasury yields best reflect what rate companies can borrow at.

As the FED increases federal funds rates, these long-term rates will increase, leading to a decrease in firm value. These rising rates are problematic for the capital-intensive technology industry, due to these rates making projects more expensive. Due to these current high rates, we project lower revenue growth in our model for the future years because these rates will negatively impact TXN's ability to funnel more investment into their future growth.

Real GDP:

Real gross domestic product and its growth rates are crucial general indicators for the technology industry. On average in the past, the technology thrives in times of high GDP growth and stagnates in times of lower or negative growth. Real GDP is also a great indicator for recessions, and according to the International Monetary Fund if there is negative growth in GDP for two consecutive quarters it is considered a recession [24].

Real GDP US Forecast

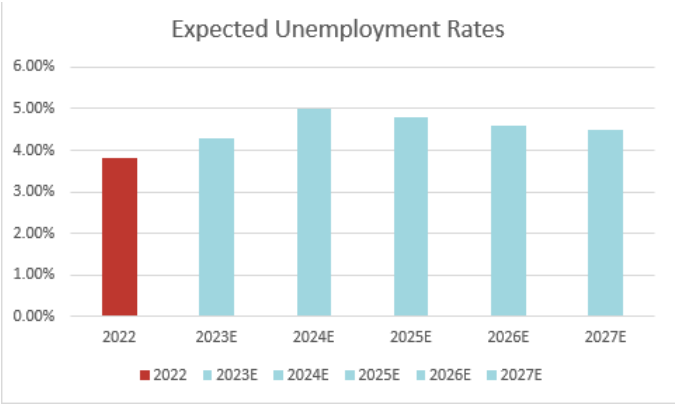


Data from [26]

The IMF projects 2023 GDP growth to be 2.1% for the United States so we are experiencing times of growth, but not tremendous growth [25]. However, it is important to note that the OECD expects the real GDP annualized growth rate to fall to 1% for the United States in 2024 [26]. We project that the US GDP growth rate will fall in the coming years due to the turbulent economic conditions, leading to lower investments, and lower revenues by technology firms.

Unemployment:

Unemployment rates are also a large economic driver for the technology industry. Due to companies wanting to retain highly skilled employees, if unemployment rates are high, it would be positively correlated with technology industry hardships. Going back the last three years, according to the Bureau of Labor Statistics, unemployment peaked at 14.70% in April of 2020, but has since gone down to pre-pandemic levels and as of October of 2023 is at 3.90% [27].



Data from [28]

As seen in the graph above Statista expects US unemployment rates to remain relatively constant and only rise to between 4.00% and 5.00% for the next five years. Despite fears of a slowing economy, due to these rates being expected to remain relatively constant in the short term, we do not expect this trend to be an issue for the technology industry, or TXN in the near future.

Consumer Confidence Index:

Consumer confidence measures how optimistic or pessimistic consumers are about the state of the economy. This gives a pulse on how consumers feel about spending money. In times when the economy is good, the consumer is more willing to spend money. The more confident the consumer is about the state of the economy and the stability of their jobs, the more likely they are to continue or increase their current rate of spending. This makes this index a key signal of how well the technology industry is doing. If consumer confidence is high, consumers are more willing to purchase technological products which are larger purchases for consumers.

Data from [29]

Relative to historical levels, consumer confidence is high. But it has considerably gone down since pre-pandemic levels and is trending down. According to the October 2023 Consumer Confidence Survey, more than two-thirds of consumers believe a recession is 'somewhat' or 'very likely' [29]. Due to decreasing consumer sentiment, in our valuation model, we decreased revenue growth rates across the board in the short term, from their previous post-pandemic boom.

Foreign Exchange Rates:

Foreign exchange rates are an important economic variable when looking at the technology industry. Most technology firms have international sales, and products made overseas. These currency translations can have major impacts on US companies, as revenues and expenses are translated to USD. In recent years the US dollar has been trending to be extremely strong. According to J.P. Morgan, the US dollar appreciated over 12% in 2022. However, since then, the dollar has trended slightly downwards. Future J.P. Morgan estimates expect it to remain strong in the following years [30].

The current strong value of the US dollar means that imports into the United States will be cheaper, and this will benefit US consumers, or producers importing supplies. However, it is important to note that strong dollar valuations can hurt US companies that export the majority of their products, such as TXN. Revenues that they earn abroad will suffer income from foreign sales decrease due to the higher US dollar valuation. We took this into consideration when projecting revenues to foreign nations through TXN and lowered revenues from these regions accordingly.

Valuation Analysis

Revenue:

Current expectations for TXN's future growth are high, will estimations of an expected FWD 3–5-year CAGR of 8.55% [31]. These high growth projections are fueled by increases in production capacity, through the development of new manufacturing plants, and an optimistic outlook on TXN's revenue projections.

We disagree with these high growth projections, and in our model, we forecast that the CAGR for TXN will be around 4.23% for future years. Current analysts are overly confident in US-China relations and are overly optimistic about consumer confidence in the foreseeable future. In 2022 revenue from China accounted for 49% of total revenues [5]. To account for this we decrease revenue from China for the following two years to account for the possibility of a total loss of this revenue stream. We still expect TXN to add revenue, but we differ from the economic consensus due to the stated reasons above.

Cost of Revenue:

TXN management provides little guidance for many operating expenses. Due to TXN's product lines not rapidly changing, it would be most accurate to forecast them by taking an average cost of revenue out of revenue. For the years 2016 to 2022, the average cost of revenue was 29%. We then forecasted the following years by using this percentage and multiplying it by the revenues of that year for the remainder of our forecasted years.

R&D and SG&A:
R&D and SG&A are also major components of TXN expenses. Little guidance from TXN management, and TXN values of a percentage of revenue remaining similar for these expenses, led us to project them similar to the cost of revenue. We got a historical average of 11% for SG&A and used that to model the forecasted years. Similarly, for R&D we used the last three-year average because we found the TXN's slight increase in R&D spending to be more reflective of their current operations. For this value, we got 9% which we then used to forecast the estimated years.

Cost of Equity:
We calculated Texas Instruments' cost of equity using the Capital Asset Pricing Model (CAPM). For the risk-free rate, we used the current yield on a 10-year treasury which was 4.86% at the end of October. For the Beta, we took an average of daily betas for ten years off Bloomberg to get the TXN beta of 1.15. We did this because we believe it negates the short-term volatility of TXN's beta. For the Equity Risk Premium (ERP), we used Damodaran's approach of trailing 12-month cash yield to get a value of 4.84%. Through these assumptions, we calculated a cost of equity of 10.41% which we then used throughout our valuation model.

Cost of Debt:
We calculated TXN's cost of debt to be 4.71%. For the pre-tax cost of debt, we used Bloomberg to find the current rate for a 10-year corporate bond of TXN. This value was 5.53%. We used TXN's marginal tax rate of 15% to calculate the final cost of debt. We also calculated an implied default premium by taking our pretax cost of debt of 5.53% and subtracting it from the previously stated risk-free rate of 4.86%. Our final implied default premium is 0.67%.

Weighted Average Cost of Capital:
After calculating the cost of equity and the cost of debt for TXN we were then able to find the weights for each of these to estimate the WACC. To calculate the market value of common equity we took TXN's total shares outstanding and then multiplied it by the current stock price as of market close on 11/10. For TXN's market value of debt, we included all sources of debt including, their current portion of long-term debt, long-term debt, and their PV of operating leases. After summing the total of these two categories we were able to then get the correct weights to calculate an estimated WACC of 10.01% for TXN. It is important to note that preferred stock was not included in the WACC calculation due to TXN not having preferred stock.

Valuation Models

Discounted Cash Flow & Economic Profit Analysis:
(Projection period 2023-2030)
Through using DCF and EP we calculated an intrinsic share price of $134.01 for TXN. Calculating the DCF and EP models considers factors such as our implied CV growth of NOPLAT, ROIC, cost of equity, and WACC. We estimated our CV growth of NOPLAT to be 4.23%, our CV growth of ROIC to be 54.91%, and our WACC to be 10.01%. We also assumed a CV growth rate of 4% despite analysts' higher recommendations due to the current standing of US and China relations as stated before. Our DCF and EP models are an accurate representation of current intrinsic value they incorporate most of our model's forecasts, and thus our take on current trade relations.

Dividend Discount Model Analysis:
(Projection period 2023-2030)
We calculated an intrinsic share price of $114.11 for TXN using the dividend discount model. TXN has always increased its dividends throughout time, however, they have done this at varying rates making projecting future dividend payments difficult. TXN is currently in the process of repurchasing many shares, most notably repurchasing $15 billion in 2022 [32]. Since TXN began its share repurchase plan in 2004 it has reduced its shares outstanding by 47% and TXN plans to continue to repurchase shares as part of its capital management plan to generate returns for its shareholders [33].

Due to TXN's inconsistency with payout policies and share repurchases, we find the DDM to be valuable for determining the intrinsic value of TXN stock but place less emphasis on it due to the difficulty of forecasting dividend growth and repurchases.

Relative Valuation Analysis:
(Projection period 2023-2030)
Our relative valuation model included tables for price-to-equity ratios and price-to-sales ratios. For our P/E relative valuations, we got an intrinsic value range from $161-197 per share for Texas instruments. For our P/S relative valuation, we got an intrinsic value of $112. For these relative valuations, we included 10 companies that we thought were TXN's closest competitors. This list includes Intel, Analog Devices, Broadcom, Microchip

Technology, Advanced Micro Devices, Applied Materials, NXP Semiconductors, ON Semiconductors, Taiwan Semiconductor, Qualcomm, and Micron Technology.

We are placing less emphasis on our P/E relative valuations. This is because there are several companies that have very high P/E ratios that do not reflect TXN, leading to an overvaluation. An example of this can be seen with AMD. which they are a major competitor of TXN, however, they have an estimated P/E ratio using data from FactSet of 43 in 2023 which is significantly larger than TXN's value of 19.3 using our model's information. Our relative model for our P/S is a more accurate representation of TXN's intrinsic value because it is not skewed by a few competitor comparisons, and it shows how much investors have been willing to pay per dollar of sales for each company.

Sensitivity Analysis

Beta vs. Equity Risk Premium:

The variables BETA and ERP are crucial to calculating a firm's WACC. As ERP and BETA decline, meaning the stock is becoming less volatile, the intrinsic value of TXN stock prices increased. Increasing or decreasing the BETA or ERP by small amounts affects the stock price by a large amount. An example of this can be seen with decreasing the ERP by .05% and decreasing the Beta by .05 will increase the value of the stock by about $7.

DCF/EP	BETA						
ERP \ 134.01	1.00	1.05	1.10	1.15	1.20	1.25	1.30
4.69%	157.28	150.33	143.95	138.05	132.60	127.54	122.83
4.74%	155.75	148.86	142.53	136.68	131.28	126.26	121.59
4.79%	154.25	147.42	141.13	135.33	129.97	125.00	120.37
4.84%	152.78	146.00	139.76	134.01	128.69	123.76	119.17
4.89%	151.33	144.60	138.42	132.71	127.44	122.54	117.99
4.94%	149.91	143.23	137.10	131.44	126.21	121.35	116.84
4.99%	148.52	141.89	135.80	130.19	125.00	120.18	115.70

Cost of Revenue as a % Sales vs. SG&A as a % Sales:

Cost of revenue and cost of sales are two of TXN's largest expenses. Because of this increasing or decreasing the % that we forecasted them by moderately affects the intrinsic value of the stock. Decreasing SG&A by .33% and Cost of revenue by .75% raises the intrinsic value of TXN by about $4.

DCF/EP	SG&A % Sales						
CoR % Sales \ 134.01	9.79%	10.12%	10.45%	10.78%	11.11%	11.44%	11.77%
26.44%	146.17	144.93	143.69	142.45	141.21	139.98	138.74
27.19%	143.35	142.11	140.88	139.64	138.40	137.16	135.93
27.94%	140.54	139.30	138.06	136.83	135.59	134.35	133.11
28.69%	137.73	136.49	135.25	134.01	132.77	131.54	130.30
29.44%	134.91	133.67	132.44	131.20	129.96	128.72	127.49
30.19%	132.10	130.86	129.62	128.39	127.15	125.91	124.67
30.94%	129.29	128.05	126.81	125.57	124.33	123.10	121.86

CV Growth of Company vs. WACC:

The CV growth of the company and WACC are the main drivers in both the DCF and EP valuation models. Small changes in this comparison affect TXN's intrinsic value dramatically. FCFs are discounted by our WACC, and the future revenues are all determined by our continuing value. Decreasing the WACC by .1 and increasing the CV growth of the company by .50% increases the value of the stock by over $10.

DCF/EP	CV Growth of Company						
WACC \ 134.01	5.73%	5.23%	4.73%	4.23%	3.73%	3.23%	2.73%
9.71%	179.27	164.13	152.03	142.14	133.91	126.95	120.98
9.81%	174.60	160.28	148.77	139.33	131.45	124.76	119.02
9.91%	170.16	156.59	145.64	136.63	129.07	122.65	117.12
10.01%	165.92	153.05	142.63	134.01	126.77	120.59	115.27
10.11%	161.87	149.67	139.73	131.49	124.54	118.60	113.47
10.21%	158.01	146.41	136.94	129.05	122.38	116.66	111.71
10.31%	154.31	143.29	134.25	126.69	120.28	114.78	110.01

Risk Free Rate vs. Pre-Tax cost of Debt:

Both the risk-free rate and the pre-tax cost of debt are used in the calculation of TXN's cost of debt and cost of equity. Due to this increasing or decreasing these rates moderately impacts the intrinsic value of the stock. By decreasing the pre-tax cost of debt by .10% and decreasing the risk-free rate by .10%, the intrinsic value of the stock rises by about $2.50.

DCF/EP	Pre Tax cost of Debt						
Risk Free Rate \ 134.01	5.23%	5.33%	5.43%	5.53%	5.63%	5.73%	5.83%
4.56%	141.80	141.61	141.42	141.23	141.05	140.86	140.67
4.66%	139.30	139.11	138.93	138.75	138.57	138.38	138.20
4.76%	136.87	136.70	136.52	136.34	136.16	135.99	135.81
4.86%	134.53	134.36	134.18	134.01	133.84	133.67	133.50
4.96%	132.26	132.09	131.92	131.76	131.59	131.42	131.26
5.06%	130.06	129.90	129.73	129.57	129.41	129.25	129.09
5.16%	127.93	127.77	127.61	127.45	127.30	127.14	126.98

Marginal Tax Rate vs. Inflation rate:

The marginal tax rate is a key factor in determining a firm's revenue, and the inflation rate greatly impacts the depreciation rate used in our model. Inflation is an important factor because semiconductor factories cost between 15 and 20 billion to create. Inflation devalues the assets quickly. These factors have a moderate impact on the valuation of TXN. Decreasing the inflation rate by .20% and decreasing the marginal tax rate by 1% raise the valuation by about $2.

DCF/EP	Forecasted Marginal Tax Rate						
Inflation \ 134.01	11.98%	12.98%	13.98%	14.98%	15.98%	16.98%	17.98%
3.20%	140.50	138.91	137.30	135.69	134.07	132.45	130.82
3.40%	139.94	138.35	136.75	135.14	133.52	131.90	130.27
3.60%	139.38	137.78	136.18	134.58	132.97	131.35	129.72
3.80%	138.80	137.21	135.62	134.01	132.40	130.79	129.16
4.00%	138.22	136.64	135.04	133.44	131.83	130.22	128.60
4.20%	137.64	136.05	134.46	132.86	131.26	129.65	128.03
4.40%	137.05	135.46	133.87	132.28	130.68	129.07	127.45

US vs. China Growth Rates:

The revenue growth rates of the United States and China are crucial factors in our model, creating most of the revenue for TXN. Due to our viewpoint that we believe these revenue growth rates are overestimated by analysis, we included them in our sensitivity analysis to show the possible downside if they are overvalued. Decreasing the TXN Chinese revenue growth rate by 10% and the US rate by 1% decreases the intrinsic value by about $7. If the US-China trade war worsens this shows how TXN will be dramatically negatively impacted.

DCF/EP	United States Growth Rate (2023 Est.)						
China Growth Rate	134.01	7%	6%	5%	4%	3%	2%	1%
	5%	150.90	150.65	150.41	150.16	149.91	149.66	149.42
	1%	148.31	148.07	147.82	147.57	147.32	147.08	146.83
	0%	147.67	147.42	147.17	146.93	146.68	146.43	146.18
	-20%	134.75	134.51	134.26	134.01	133.77	133.52	133.27
	-30%	128.31	128.06	127.81	127.57	127.32	127.07	126.83
	-50%	115.43	115.19	114.94	114.69	114.45	114.20	113.95
	-100%	83.37	83.12	82.88	82.63	82.39	82.14	81.90

Conclusion

We designated Texas Instruments as a SELL rating due to the current trade war with China. Potential revenue losses can reach 50% if the geopolitical relations between the US and China continue to deteriorate. We believe current analysts are overly optimistic in these relations and do not advise that the Krause Fund take on this holding.

Important Disclaimer

This report was created by students enrolled in the Applied Equity Valuation class at the University of Iowa. The report was originally created to offer an internal investment recommendation for the University of Iowa Krause Fund and its advisory board. The report also provides potential employers and other interested parties an example of the students' skills, knowledge, and abilities. Members of the Krause Fund are not registered investment advisors, brokers or officially licensed financial professionals. The investment advice contained in this report does not represent an offer or solicitation to buy or sell any of the securities mentioned. Unless otherwise noted, facts and figures included in this report are from publicly available sources. This report is not a complete compilation of data, and its accuracy is not guaranteed. From time to time, the University of Iowa, its faculty, staff, students, or the Krause Fund may hold a financial interest in the companies mentioned in this report.

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Texas Instruments Incorporated

Revenue Decomposition

Fiscal Years Ending Dec. 31	2019	2020	2021	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Revenue:												
United States	1,827	1,547	1,906	2,267	2,358	2,523	2,725	2,970	3,237	3,496	3,741	3,928
China (a)	-	7,881	9,998	9,844	7,875	6,694	6,025	5,723	5,723	6,296	6,925	7,271
Rest of Asia (China included in rest of Asia from 2016-19)	8,650	1,660	2,187	2,633	3,160	3,697	4,214	4,720	5,334	5,814	6,221	6,532
Europe, Middle East and Africa	2,707	2,249	2,802	3,520	4,189	4,859	5,393	5,771	6,060	6,302	6,491	6,686
Japan	796	734	959	1,172	1,254	1,317	1,369	1,410	1,439	1,453	1,453	1,453
Rest of world	403	390	492	592	710	852	989	1,147	1,319	1,517	1,593	1,673
Total revenue	14,383	14,461	18,344	20,028	19,546	19,942	20,715	21,742	23,111	24,877	26,423	27,542
Growth % change by Revenue	-8.88%	0.54%	26.85%	9.18%	-2.41%	2.03%	3.88%	4.96%	6.30%	7.64%	6.22%	4.23%
Growth % change United States	-20.15%	-15.33%	23.21%	18.94%	4.00%	7.00%	8.00%	9.00%	9.00%	8.00%	7.00%	5.00%
Growth % change China	-	-	26.86%	-1.54%	-20.00%	-15.00%	-10.00%	-5.00%	0.00%	10.00%	10.00%	5.00%
Growth % change Rest of Asia	-6.39%	-80.81%	31.75%	20.39%	20.00%	17.00%	14.00%	12.00%	13.00%	9.00%	7.00%	5.00%
Growth % change Europe, Middle East and Africa	-11.16%	-16.92%	24.59%	25.62%	19.00%	16.00%	11.00%	7.00%	5.00%	4.00%	3.00%	3.00%
Growth % change Japan	-8.40%	-7.79%	30.65%	22.21%	7.00%	5.00%	4.00%	3.00%	2.00%	1.00%	0.00%	0.00%
Growth % change Rest of world	18.53%	-3.23%	26.15%	20.33%	20.00%	20.00%	16.00%	16.00%	15.00%	15.00%	5.00%	5.00%

Texas Instruments Incorporated

Income Statement

Millions

Fiscal Years Ending Dec. 31	2020	2021	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Revenue	14461	18344	20028	19546	19942	20715	21742	23111	24877	26423	27542
Cost of revenue (COR) (excluding DAA)	4200	5014	5278	5607	5721	5943	6237	6630	7137	7580	7901
Depreciation	733	755	925	967	1115	1252	1382	1504	1622	1735	1846
Amortization of acquisition-related intangibles	198	142	0	0	0	0	0	0	0	0	0
Amortization of captialized software	61	57	54	46	39	31	23	15	8	0	0
Gross profit	9269	12376	13771	12925	13067	13489	14100	14961	16111	17108	17795
Research & development (R&D)	1530	1554	1670	1759	1794	1864	1956	2080	2239	2378	2478
Selling, general & administrative (SG&A)	1623	1666	1704	2107	2150	2233	2344	2491	2682	2848	2969
Acquisition charges	198	142	0	0	0	0	0	0	0	0	0
Restructuring charges or other	24	54	257	0	0	0	0	0	0	0	0
Operating profit (loss)	5894	8960	10140	9059	9123	9392	9800	10390	11191	11882	12348
Other income (expense), net (OI&E)	313	143	106	508	527	506	509	521	567	633	718
Interest & debt expense	190	184	214	483	538	569	611	641	678	721	778
Income (loss) before income taxes	6017	8919	10032	8068	8058	8316	8680	9228	9946	10527	10851
Provision (benefit) for income taxes	422	1150	1283	1208	1207	1245	1300	1382	1489	1576	1625
Net income (loss)	5595	7769	8749	6860	6851	7071	7380	7846	8456	8951	9226
Earnings per common share (EPS):											
Basic Earnings Per Share (EPS)	6.05	8.38	9.51	7.63	7.74	8.10	8.56	9.21	10.06	10.80	11.30
Total Shares Outstanding (basic)	919	924	906	892	879	867	857	847	835	822	811
Weighted Average Shares Outstanding (basic)	921	923	916	899	885	873	862	852	841	829	817
Annual Dividends per Share	3.72	4.21	4.69	5.02	5.09	5.10	5.14	5.16	5.23	5.72	6.17

Texas Instruments Incorporated

Balance Sheet

(millions)

Fiscal Years Ending Dec. 31	2020	2021	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Assets											
Current assets:											
Cash & cash equivalents	3107	4631	3050	3051	2331	2002	1828	2218	2968	4014	4788
Short-term investments	3461	5108	6017	6354	6710	7086	7482	7901	8344	8811	9304
Accounts receivable, net	1414	1701	1895	1721	1756	1824	1915	2035	2191	2327	2425
Inventories	1955	1910	2757	2572	2624	2726	2861	3042	3274	3477	3625
Prepaid expenses & other current assets	302	335	302	402	410	426	447	476	512	544	567
Total current assets	10239	13685	14021	14101	13831	14065	14534	15672	17288	19173	20709
Property, plant & equipment at cost	5781	7858	9950	11965	14057	16228	18482	20822	23250	25771	28387
Accumulated depreciation	-2512	-2717	-3074	-4041	-5156	-6408	-7790	-9294	-10916	-12651	-14497
Net Property, plant & equipment	3269	5141	6876	7924	8901	9820	10692	11527	12334	13119	13890
Goodwill	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362	4362
Deferred tax assets	343	263	473	467	460	454	448	441	435	429	423
Capitalized software licenses	122	85	152	130	109	87	65	43	22	0	0
Overfunded retirement plans	246	392	188	208	229	253	279	309	341	376	415
Other long-term assets	569	748	1135	1196	1260	1328	1400	1475	1554	1638	1726
Long-term investments	49	0	0	0	0	0	0	0	0	0	0
Acquisition-related intangibles	152	0	0	0	0	0	0	0	0	0	0
Total assets	19351	24676	27207	28387	29153	30368	31780	33830	36336	39098	41526
Liabilities and stockholders' equity											
Current liabilities:											
Current portion of long-term debt	550	500	500	500	600	750	500	500	500	750	750
Accounts payable	415	653	851	628	640	665	698	742	799	849	885
Accrued compensation	767	775	799	927	946	983	1031	1096	1180	1253	1307
Income taxes payable	134	121	189	188	188	194	202	215	232	245	253
Accrued expenses & other liabilities	524	520	646	612	625	649	681	724	779	828	863
Total current liabilities	2390	2569	2985	2855	2999	3240	3113	3277	3490	3925	4056
Long-term debt	6248	7241	8235	9230	9689	10293	11079	11755	12526	13313	14059
Underfunded retirement plans	131	79	118	101	84	67	51	34	17	0	0
Deferred tax liabilities	90	87	66	71	76	82	88	95	102	110	118
Deferred credits & other long-term liabilities	1305	1367	1226	1485	1594	1637	1728	1773	1875	1994	2129
Total liabilities	10164	11343	12630	13742	14442	15320	16058	16934	18010	19342	20362
Stockholders equity:											
Common equity	4074	4371	4692	5191	5690	6188	6687	7186	7336	7336	7336
Retained earnings	42051	45919	50353	52700	55044	57661	60613	64065	68124	72331	76517
Treasury common stock at cost											
Shares: 2022 - 835; 2021 - 817	-36578	-36800	-40214	-42992	-45769	-48547	-51324	-54102	-56879	-59657	-62435
Accumulated other comprehensive income (loss), net of taxes (AOCI)	-360	-157	-254	-254	-254	-254	-254	-254	-254	-254	-254
Total stockholders' equity	9187	13333	14577	14645	14711	15048	15721	16895	18326	19756	21164
Total liabilities and stockholders' equity	19351	24676	27207	28387	29153	30368	31780	33830	36336	39098	41526

Texas Instruments Incorporated

Historical Cash Flow Statement (Pg. 27)

Millions

Fiscal Years Ending Dec. 31	2016	2017	2018	2019	2020	2021	2022
Cash Flows from Operating Activities							
Net income (loss)	3595	3682	5580	5017	5595	7769	8749
Adjustments to net income:							
Depreciation	605	539	590	708	733	755	925
Amortization of acquisition-related intangibles	319	318	318	288	198	142	-
Amortization of capitalized software	31	47	46	54	61	57	54
Stock compensation	252	242	232	217	224	230	289
Losses (gains) on sales of assets	-40	-	-3	-23	-4	-57	-3
Deferred taxes	-202	112	-105	81	-137	15	-191
Increase (Decrease) from changes in:							
Accounts receivable	-108	-7	71	133	-340	-287	-194
Inventories	-99	-167	-282	216	46	45	-847
Prepaid expenses & other current assets	-81	76	669	265	-79	57	6
Accounts payable & accrued expenses	72	51	-7	-93	63	33	106
Accrued compensation	36	-3	-7	-15	63	7	22
Income taxes payable	333	468	158	-193	-181	-20	94
Changes in funded status of retirement plans	-73	21	36	29	-9	62	114
Other operating activities	-26	-16	-107	-35	-94	-52	-404
Net cash flows from operating activities	4614	5363	7189	6649	6139	8756	8720
Cash Flows from Investing Activities							
Capital expenditures	-531	-695	-1131	-847	-649	-2462	-2797
Proceeds from asset sales	-	40	9	30	4	75	3
Purchases of short-term investments	-3503	-4555	-5641	-3444	-5786	-10124	-14483
Proceeds from short-term investments	3390	4095	6708	2309	5545	8478	13657
Other investing activities	-6	-12	-23	32	-36	-62	37
Net cash flows from investing activities	-650	-1127	-78	-1920	-922	-4095	-3583
Cash Flows from Financing Activities							
Proceeds from issuance of long-term debt	499	1099	1500	1491	1498	1495	1494
Repayment of debt	-1000	-625	-500	-750	-500	-550	-500
Dividends paid	-1646	-2104	-2555	-3008	-3426	-3886	-4297
Stock repurchases	-2132	-2556	-5100	-2960	-2553	-527	-3615
Proceeds from common stock transactions	472	483	373	539	470	377	241
Other financing activities	-3	-31	-47	-42	-36	-46	-41
Net cash flows from financing activities	-3810	-3734	-6329	-4730	-4547	-3137	-6718
Net change in cash & cash equivalents	154	502	782	-1	670	1524	-1581
Cash & cash equivalents at beginning of period	1000	1154	1656	2438	2437	3107	4631
Cash & cash equivalents at end of period	1154	1656	2438	2437	3107	4631	3050

Texas Instruments Incorporated

Forecasted Cash Flow Statement

Fiscal Years Ending Dec. 31	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Cash from Operating Activities								
Net Income (Loss)	6860	6851	7071	7380	7846	8456	8951	9226
Depreciation +	967	1115	1252	1382	1504	1622	1735	1846
Change in accounts Receivable net	174	-35	-68	-90	-121	-156	-136	-99
Change In Inventories	185	-52	-102	-135	-180	-232	-203	-147
Change in Prepaid expenses and other current assets	-100	-8	-16	-21	-28	-36	-32	-23
Change in Differed Tax assets	6	6	6	6	6	6	6	6
Change in Capitalized Software licenses	22	22	22	22	22	22	22	0
Change in Overfunded retirement plan	0	0	0	0	0	0	0	0
Change in other long-term assets	-61	-64	-68	-71	-75	-79	-84	-88
Change in Accounts Payable	-223	13	25	33	44	57	50	36
Change in Accrued Compensation	128	19	37	49	65	84	73	53
Change in Income Taxes Payable	-1	0	6	8	13	17	14	8
Change in Accrued expenses and other liabilities	-34	12	24	32	43	55	48	35
Change in underfunded retirement plans	-17	-17	-17	-17	-17	-17	-17	0
Net Cash Providing by Operating Activities	7905	7862	8173	8577	9122	9798	10427	10853
Cash from Investing Activities								
Capital Expenditures	-2015	-2092	-2171	-2254	-2339	-2428	-2521	-2616
Change in short-term investments	-337	-356	-376	-397	-419	-442	-467	-493
Change in Long-term investments	0	0	0	0	0	0	0	0
Change in Acquisition related intangibles	0	0	0	0	0	0	0	0
Change in deferred tax liabilities	5	5	6	6	7	7	8	8
Change in Overfunded retirement plan	-20	-22	-24	-26	-29	-32	-35	-39
Change in deferred credits and other long-term liabiliti	259	108	44	91	45	102	119	135
Net Cash Provided from Investing Activities	-2108	-2355	-2522	-2580	-2736	-2794	-2896	-3006
Cash From Financing Activities								
Change in common equity	499	499	499	499	499	150	0	0
Dividends	-4513	-4507	-4455	-4428	-4394	-4397	-4744	-5040
Change in current portion long-term debt	0	100	150	-250	0	0	250	0
Change in long-term debt	995	459	604	785	677	771	787	745
Change in Treasury Stock	-2778	-2778	-2778	-2778	-2778	-2778	-2778	-2778
Change in other comprehensive loss	0	0	0	0	0	0	0	0
Net Cash Provided By Financing Activities	-5797	-6227	-5979	-6171	-5996	-6255	-6484	-7073
Total:	1	-720	-328	-174	390	749	1046	774
Ending Cash	3051	2331	2002	1828	2218	2968	4014	4788

Texas Instruments Incorporated

Common Size Income Statement

Fiscal Years Ending Dec. 31	2020	2021	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Revenue	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Cost of revenue (COR) (excluding DAA)	29.04%	27.33%	26.35%	28.69%	28.69%	28.69%	28.69%	28.69%	28.69%	28.69%	28.69%
Depreciation	5.07%	4.12%	4.62%	4.95%	5.59%	6.05%	6.35%	6.51%	6.52%	6.57%	6.70%
Amortization of acquisition-related intangibles	1.37%	0.77%	-	-	-	-	-	-	-	-	-
Amortization of captialized software	0.42%	0.31%	0.27%	0.24%	0.19%	0.15%	0.11%	0.07%	0.03%	0.00%	0.00%
Gross profit	64.10%	67.47%	68.76%	66.13%	65.53%	65.12%	64.85%	64.74%	64.76%	64.74%	64.61%
Research & development (R&D)	10.58%	8.47%	8.34%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Selling, general & administrative (SG&A)	11.22%	9.08%	8.51%	10.78%	10.78%	10.78%	10.78%	10.78%	10.78%	10.78%	10.78%
Acquisition charges	1.37%	0.77%	-	-	-	-	-	-	-	-	-
Restructuring charges or other	0.17%	0.29%	1.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Operating profit (loss)	40.76%	48.84%	50.63%	46.35%	45.75%	45.34%	45.07%	44.96%	44.98%	44.97%	44.83%
Other income (expense), net (OI&E)	2.16%	0.78%	0.53%	2.60%	2.64%	2.44%	2.34%	2.26%	2.28%	2.40%	2.61%
Interest & debt expense	1.31%	1.00%	1.07%	2.47%	2.70%	2.75%	2.81%	2.77%	2.73%	2.73%	2.83%
Income (loss) before income taxes	41.61%	48.62%	50.09%	41.28%	40.41%	40.15%	39.92%	39.93%	39.98%	39.84%	39.40%
Provision (benefit) for income taxes	2.92%	6.27%	6.41%	6.18%	6.05%	6.01%	5.98%	5.98%	5.99%	5.97%	5.90%
Net income (loss)	38.69%	42.35%	43.68%	35.10%	34.36%	34.13%	33.94%	33.95%	33.99%	33.88%	33.50%

Texas Instruments Incorporated

Common Size Balance Sheet

Fiscal Years Ending Dec. 31	2020	2021	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Assets											
Current assets:											
Cash & cash equivalents	21.49%	25.25%	15.23%	15.61%	11.69%	9.67%	8.41%	9.60%	11.93%	15.19%	17.38%
Short-term investments	23.93%	27.85%	30.04%	32.51%	33.65%	34.20%	34.41%	34.19%	33.54%	33.35%	33.78%
Accounts receivable, net	9.78%	9.27%	9.46%	8.81%	8.81%	8.81%	8.81%	8.81%	8.81%	8.81%	8.81%
Inventories	13.52%	10.41%	13.77%	13.16%	13.16%	13.16%	13.16%	13.16%	13.16%	13.16%	13.16%
Prepaid expenses & other current assets	2.09%	1.83%	1.51%	2.06%	2.06%	2.06%	2.06%	2.06%	2.06%	2.06%	2.06%
Total current assets	70.80%	74.60%	70.01%	72.14%	69.36%	67.90%	66.85%	67.81%	69.49%	72.56%	75.19%
Property, plant & equipment at cost	39.98%	42.84%	49.68%	61.22%	70.49%	78.34%	85.01%	90.09%	93.46%	97.53%	103.07%
Accumulated depreciation	-17.37%	-14.81%	-15.35%	-20.68%	-25.86%	-30.94%	-35.83%	-40.22%	-43.88%	-47.88%	-52.64%
Property, plant & equipment	22.61%	28.03%	34.33%	40.54%	44.63%	47.40%	49.18%	49.88%	49.58%	49.65%	50.43%
Goodwill	30.16%	23.78%	21.78%	22.32%	21.87%	21.06%	20.06%	18.87%	17.53%	16.51%	15.84%
Deferred tax assets	2.37%	1.43%	2.36%	2.39%	2.31%	2.19%	2.06%	1.91%	1.75%	1.62%	1.54%
Capitalized software licenses	0.84%	0.46%	0.76%	0.67%	0.54%	0.42%	0.30%	0.19%	0.09%	0.00%	0.00%
Overfunded retirement plans	1.70%	2.14%	0.94%	1.06%	1.15%	1.22%	1.29%	1.33%	1.37%	1.42%	1.51%
Other long-term assets	3.93%	4.08%	5.67%	6.12%	6.32%	6.41%	6.44%	6.38%	6.25%	6.20%	6.27%
Long-term investments	0.34%										
Acquisition-related intangibles	1.05%										
Total assets	133.82%	134.52%	135.84%	145.24%	146.19%	146.60%	146.17%	146.38%	146.06%	147.97%	150.77%
Liabilities and stockholders' equity	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Current liabilities:	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Current portion of long-term debt	3.80%	2.73%	2.50%	2.56%	3.01%	3.62%	2.30%	2.16%	2.01%	2.84%	2.72%
Accounts payable	2.87%	3.56%	4.25%	3.21%	3.21%	3.21%	3.21%	3.21%	3.21%	3.21%	3.21%
Accrued compensation	5.30%	4.22%	3.99%	4.74%	4.74%	4.74%	4.74%	4.74%	4.74%	4.74%	4.74%
Income taxes payable	0.93%	0.66%	0.94%	0.96%	0.94%	0.93%	0.93%	0.93%	0.93%	0.93%	0.92%
Accrued expenses & other liabilities	3.62%	2.83%	3.23%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
Total current liabilities	16.53%	14.00%	14.90%	14.61%	15.04%	15.64%	14.32%	14.18%	14.03%	14.85%	14.73%
Long-term debt	43.21%	39.47%	41.12%	47.22%	48.59%	49.69%	50.96%	50.86%	50.35%	50.38%	51.04%
Underfunded retirement plans	0.91%	0.43%	0.59%	0.52%	0.42%	0.33%	0.23%	0.15%	0.07%	0.00%	0.00%
Deferred tax liabilities	0.62%	0.47%	0.33%	0.36%	0.38%	0.40%	0.41%	0.41%	0.41%	0.41%	0.43%
Deferred credits & other long-term liabilities	9.02%	7.45%	6.12%	7.60%	7.99%	7.90%	7.95%	7.67%	7.54%	7.55%	7.73%
Total liabilities	70.29%	61.83%	63.06%	70.31%	72.42%	73.96%	73.86%	73.27%	72.39%	73.20%	73.93%
Stockholders equity:											
Common Equity	28.17%	23.83%	23.43%	26.56%	28.53%	29.87%	30.76%	31.09%	29.49%	27.76%	26.63%
Retained earnings	290.79%	250.32%	251.41%	269.62%	276.03%	278.35%	278.78%	277.20%	273.84%	273.74%	277.82%
Treasury common stock at cost	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Shares: 2022 - 835; 2021 - 817	-252.94%	-200.61%	-200.79%	-219.95%	-229.52%	-234.35%	-236.06%	-234.09%	-228.64%	-225.77%	-226.69%
Accumulated other comprehensive income (	-2.49%	-0.86%	-1.27%	-1.30%	-1.27%	-1.23%	-1.17%	-1.10%	-1.02%	-0.96%	-0.92%
Total stockholders' equity	63.53%	72.68%	72.78%	74.93%	73.77%	72.64%	72.31%	73.10%	73.67%	74.77%	76.84%
Total liabilities and stockholders' equity	133.82%	134.52%	135.84%	145.24%	146.19%	146.60%	146.17%	146.38%	146.06%	147.97%	150.77%

Texas Instruments Incorporated
Value Driver Estimation

Fiscal Years Ending Dec. 31	2020	2021	2022	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
NOPLAT:											
Revenue	14461	18344	20028	19546	19942	20715	21742	23111	24877	26423	27542
Cost of revenue (COR) (excluding DAA)	4200	5014	5278	5607	5721	5943	6237	6630	7137	7580	7901
Depreciation	733	755	925	967	1115	1252	1382	1504	1622	1735	1846
Amortization of acquisition-related intangibles	198	142	0	0	0	0	0	0	0	0	0
Amortization of capitalized software	61	57	54	46	39	31	23	15	8	0	0
Research & development (R&D)	1530	1554	1670	1759	1794	1864	1956	2080	2239	2378	2478
Selling, general & administrative (SG&A)	1623	1666	1704	2107	2150	2233	2344	2491	2682	2848	2969
interest of PV operating leases	10	16	23	21	21	21	21	21	21	21	21
EBITA	6106	9140	10374	9038	9103	9372	9779	10370	11170	11861	12327
Less: Adjusted Taxes											
Income tax expense	422.0	1150.0	1283.0	1208.2	1206.7	1245.4	1299.8	1381.9	1489.4	1576.5	1625.0
Tax shield on operating lease interest	1.6	2.4	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Tax shield on Acquisition charges	29.5	21.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tax shield on Restructuring Charges	3.6	8.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tax Shield on Interest and debt Expense	46.6	21.3	14.8	76.0	78.9	75.8	76.2	78.1	84.9	94.9	107.6
Tax Shield on Other Expense	28.3	27.4	30.0	72.4	80.6	85.3	91.5	96.0	101.6	108.0	116.6
Tax Rate	14.90%	14.90%	14.00%	14.98%	14.98%	14.98%	14.98%	14.98%	14.98%	14.98%	14.98%
Adjusted Taxes	532	1230	1367	1360	1369	1410	1471	1559	1679	1782	1852
Plus: Change in Net Deferred Tax Liabilities											
Change in Differed Taxes	-134	77	-231	11	12	12	12	13	13	14	14
Plus Change in deferred tax liability	-134	77	-231	11	12	12	12	13	13	14	14
NOPLAT:	**5440**	**7986**	**8776**	7690	7745	7974	8321	8824	9504	10092	10489
Invested Capital (IC):											
Revenue	14461	18344	20028	19546	19942	20715	21742	23111	24877	26423	27542
Normal cash	1248	1583	1729	1687	1721	1788	1877	1995	2147	2281	2377
Net operating working capital											
Add operating Current Assets											
Accounts receivable, net	1414	1701	1895	1721	1756	1824	1915	2035	2191	2327	2425
Inventories	1955	1910	2757	2572	2624	2726	2861	3042	3274	3477	3625
Prepaid expenses & other current assets	302	335	302	402	410	426	447	476	512	544	567
Total current operating assets	4919	5529	6683	6383	6512	6765	7100	7547	8124	8629	8994
less Non interest-bearing current liabilities											
Current liabilities:											
Accounts payable	415	653	851	628	640	665	698	742	799	849	885
Accrued compensation	767	775	799	927	946	983	1031	1096	1180	1253	1307
Income taxes payable	134	121	189	188	188	194	202	215	232	245	253
Accrued expenses & other liabilities	524	520	646	612	625	649	681	724	779	828	863
Total current operating liabilities	1840	2069	2485	2355	2399	2490	2613	2777	2990	3175	3306
Net operating working capital	3079	3460	4198	4028	4114	4274	4487	4770	5134	5454	5688
Plus Net PPE	3269	5141	6876	7924	8901	9820	10692	11527	12334	13119	13890
Plus Other long term assets	569	748	1135	1196	1260	1328	1400	1475	1554	1638	1726
Plus PV Operating Leases	294	410	373	373	373	373	373	373	373	373	373
less Non interest-bearing current liabilities											
Deferred credits & other long-term liabilities	1305	1367	1226	1485	1594	1637	1728	1773	1875	1994	2129
Invested Capital (IC):	**5906**	**8393**	**11356**	12036	13054	14158	15224	16372	17520	18590	19548
Free Cash Flow (FCF):											
NOPLAT	5440	7986	8776	7690	7745	7974	8321	8824	9504	10092	10489
Change in IC	467	2487	2963	680	1018	1104	1066	1148	1148	1070	958
FCF	4973	5500	5813	7010	6727	6870	7255	7676	8356	9023	9531
Return on Invested Capital (ROIC):											
NOPLAT	5440	7986	8776	7690	7745	7974	8321	8824	9504	10092	10489
Beginning IC	$ 5,439	$ 5,906	$ 8,393	$ 11,356	$ 12,036	$ 13,054	$ 14,158	$ 15,224	$ 16,372	$ 17,520	$ 18,590
ROIC	**100.02%**	**135.22%**	**104.57%**	67.72%	64.35%	61.08%	58.77%	57.96%	58.05%	57.60%	56.42%
Economic Profit (EP):											
Beginning IC	$ 5,439	$ 5,906	$ 8,393	$ 11,356	$ 12,036	$ 13,054	$ 14,158	$ 15,224	$ 16,372	$ 17,520	$ 18,590
x (ROIC - WACC)	90.01%	125.22%	94.56%	57.71%	54.34%	51.08%	48.76%	47.95%	48.05%	47.60%	46.42%
EP	$ 4,896	$ 7,395	$ 7,937	$ 6,554	$ 6,541	$ 6,668	$ 6,904	$ 7,300	$ 7,866	$ 8,339	$ 8,629

Texas Instruments Incorporated
Weighted Average Cost of Capital (WACC) Estimation

Cost of Equity:		
Risk-Free Rate	4.86%	
Beta	1.15	
Equity Risk Premium	4.84%	
Cost of Equity	**10.41%**	
Cost of Debt:		
Risk-Free Rate	4.86%	
Implied Default Premium	0.67%	
Pre-Tax Cost of Debt	5.53%	
Marginal Tax Rate	15%	
After-Tax Cost of Debt	**4.71%**	
Market Value of Common Equity:		**MV Weights**
Total Shares Outstanding	892	
Current Stock Price	$147.19	
MV of Equity	**131,271**	92.85%
Market Value of Debt:		
Short-Term Debt	0	
Current Portion of LTD	500	
Long-Term Debt	9230	
PV of Operating Leases	373	
MV of Total Debt	**10,102.97**	7.15%
Market Value of the Firm	**141,373.8**	100.00%
	Estimated WACC	**10.01%**

Texas Instruments Incorporated

Discounted Cash Flow (DCF) and Economic Profit (EP) Valuation Models

Key Inputs:

CV Growth of NOPLAT	4.23%
CV Year ROIC	56.42%
WACC	10.01%
Cost of Equity	10.41%

Fiscal Years Ending Dec. 31	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
DCF Model:								
Free Cash Flow (FCF)	7010.1	6726.6	6870.0	7255.1	7675.7	8355.9	9022.8	9531.3
Continuing Value (CV)								168059.4
PV of FCF	6372.4	5558.5	5160.6	4954.1	4764.6	4715.0	4628.1	86204.1

Value of Operating Assets:	122357.3
Non-Operating Adjustments	
Excess cash	1364.1
Add (less)	
Overfunded retirement plans +	207.6
Other long-term assets +	1196.1
Long-term investments +	0.0
Less (add)	
Long-term debt -	-9229.8
Underfunded retirement plans -	-101.1
Deferred credits & other long-term liabilities -	-1485.1
ESOP	-1261.5
Value of Equity	113047.6
Shares Outstanding	891.8
Intrinsic Value of Last FYE	$ 126.76
Implied Price as of Today	$ 134.01

EP Model:								
Economic Profit (EP)	6553.8	6540.7	6667.7	6904.0	7300.1	7866.1	8339.2	8628.9
Continuing Value (CV)								149469.3
PV of EP	5957.6	5404.9	5008.6	4714.4	4531.4	4438.6	4277.5	76668.6

Total PV of EP	111001.5
Invested Capital (last FYE)	11355.8
Value of Operating Assets:	122357.3
Non-Operating Adjustments	
Excess cash	1364.1
Add (less)	
Overfunded retirement plans +	207.6
Other long-term assets +	1196.1
Long-term investments +	0.0
Less (add)	
Long-term debt -	-9229.8
Underfunded retirement plans -	-101.1
Deferred credits & other long-term liabilities -	-1485.1
ESOP	-1261.5
Value of Equity	113047.6
Shares Outstanding	891.8
Intrinsic Value of Last FYE	$ 126.76
Implied Price as of Today	$ 134.01

Texas Instruments Incorporated

Dividend Discount Model (DDM) or Fundamental P/E Valuation Model

Fiscal Years Ending Dec. 31	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
EPS	$ 7.63	$ 7.74	$ 8.10	$ 8.56	$ 9.21	$ 10.06	$ 10.80	$ 11.30
Key Assumptions								
CV growth of EPS	4.23%							
CV Year ROE	46.70%							
Cost of Equity	10.41%							
Future Cash Flows								
P/E Multiple (CV Year)								14.71
EPS (CV Year)								$ 11.30
Future Stock Price								$ 166.22
Dividends Per Share	5.02	5.09	5.10	5.14	5.16	5.23	5.72	6.17
Discounted Cash Flows	4.55	4.18	3.79	3.46	3.14	2.89	2.86	$ 83.08

Intrinsic Value as of Last FYE	$ 107.94
Implied Price as of Today	$ 114.11

Texas Instruments Incorporated

Relative Valuation Models

Ticker	Company	Price	EPS 2023E	EPS 2024E	P/E 23	P/E 24	Revenue 2023E	Revenue 2024E	Shares Outstanding	Sales per share 23	Sales per share 24	P/S 23	P/S 24
INTC	INTEL CORPORATION	$ 38.09	$0.94	$1.91	40.52	19.94	$ 53,937	$ 61,089	4220	12.78	14.48	2.98	2.63
ADI	ANALOG DEVICES, INC.	$ 168.64	$10.09	$8.41	16.71	20.05	$ 12,297	$ 11,055	498.32	24.68	22.19	6.83	7.60
AVGO	BROADCOM INCORPORATED	$ 911.38	$42.11	$46.31	21.64	19.68	$ 35,814	$ 39,151	412.74	86.77	94.86	10.50	9.61
MCHP	INCORPORATED	$ 74.42	$5.40	$4.83	13.78	15.41	$ 81,651	$ 7,670	541.04	150.91	14.18	0.49	5.25
AMD	ADVANCED MICRO DEVICES, INC.	$ 113.87	$2.62	$3.80	43.46	29.97	$ 22,714	$ 26,702	1620	14.02	16.48	8.12	6.91
AMAT	APPLIED MATERIALS, INC.	$ 144.39	$7.92	$7.76	18.23	18.61	$ 26,321	$ 26,145	836.53	31.46	31.25	4.59	4.62
NXPI	NXP Semiconductors NV	$ 181.20	$13.97	$14.59	12.97	12.42	$ 12,253	$ 13,647	257.76	47.54	52.94	3.81	3.42
ON	CORPORATION	$ 64.71	$5.11	$4.75	12.66	13.62	$ 8,246	$ 8,105	430.7	19.14	18.82	3.38	3.44
TSM	Manufacturing Co., Ltd.	$ 92.02	$4.93	$5.81	18.66	15.84	$ 66,565	$ 80,455	5190	12.83	15.50	7.17	5.94
QCOM	QUALCOMM INCORPORATED	$ 120.30	$9.54	$10.64	12.61	11.31	$ 36,313	$ 41,713	1110	32.71	37.58	3.68	3.20
MU	MICRON TECHNOLOGY, INC.	$ 73.94	($3.50)	$0.72		102.69	$ 24,042	$ 31,522	1100	21.86	28.66	3.38	2.58
				Average	21.13	25.41					Average:	5.00	5.02
TXN	Texas Instruments Incorporated	$ 147.19	$7.63	$7.74	19.3	19.0	19,545.72	19,941.60	891.85	21.92	22.36		

Implied Relative Value:	With Outliers	Without Outliers
P/E (EPS23)	**$ 161.21**	**$ 121.41**
P/E (EPS24)	**$ 196.65**	**$ 136.84**
P/S (2024)	**$ 112.20**	

Texas Instruments Incorporated

Key Management Ratios

Fiscal Years Ending Dec. 31	2020	2021	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Liquidity Ratios:											
Current Ratio = Current Assets / Current Liabilities	4.28	5.33	4.70	4.94	4.61	4.34	4.67	4.78	4.95	4.89	5.11
Quick Ratio = current asset - Inventories / liabilities	0.82	1.04	0.89	0.84	0.78	0.74	0.73	0.75	0.78	0.81	0.84
Operating Cash Flow Ratio = Operating cash flow / total debts	0.31	0.41	0.24	0.22	0.16	0.13	0.11	0.13	0.16	0.21	0.24
Cash Ratio = (Cash + Marketable Securities) / Current liabilities	2.75	3.79	3.04	3.29	3.01	2.80	2.99	3.09	3.24	3.27	3.47
Asset-Management Ratios: [Asset turnover Ratios]											
Inventory Turnover = COGS / Average Inventory	2.02	2.41	2.53	2.69	2.75	2.85	2.99	3.18	3.42	3.64	3.79
Degree of Operating Leverage = % change NOI / % change in sales	0.39	0.42	0.44	0.35	0.34	0.34	0.34	0.34	0.34	0.34	0.33
Asset turnover ratio (Asset Turnover Ratio = Net Sales / Total Assets)	0.75	0.74	0.74	0.69	0.68	0.68	0.68	0.68	0.68	0.68	0.66
Financial Leverage Ratios:											
Debt Ratio = Total Assets/ Total Liabilities	1.90	2.18	2.15	2.07	2.02	1.98	1.98	2.00	2.02	2.02	2.04
Debt to Equity Ratio = Total Debt / Total Equity	1.11	0.85	0.87	0.94	0.98	1.02	1.02	1.00	0.98	0.98	0.96
Interest Coverage = EBIT / Interest Expenses	32.13	49.67	48.48	18.70	16.90	16.46	16.00	16.18	16.47	16.45	15.84
Profitability Ratios:											
Return on Equity (Net Income / Beg Total Shareholder Equity)	162%	200%	150%	134%	136%	141%	144%	147%	147%	144%	139%
Return on Assets = Net Income / Total Assets	75%	74%	74%	69%	68%	68%	68%	68%	68%	68%	66%
Gross Profit Margin = (Sales - Cost of Goods Sold) / Sales	71%	73%	74%	71%	71%	71%	71%	71%	71%	71%	71%
Payout Policy Ratios:											
Dividend Payout Ratio (Dividend/EPS)	61.23%	50.02%	49.11%	65.78%	65.78%	63.00%	60.00%	56.00%	52.00%	53.00%	54.63%
Total Payout Ratio ((Divs. + Repurchases)/NI)	15.50%	43.29%	7.25%	14.21%	13.93%	13.41%	12.78%	12.02%	11.17%	10.51%	10.08%
Retention Ratio (Retained Earnings/ Net Income)	38.77%	49.98%	50.89%	34.22%	34.22%	37.00%	40.00%	44.00%	48.00%	47.00%	45.37%

Texas Instruments Incorporated

Valuation of Options Granted under ESOP

Current Stock Price	$147.19
Risk Free Rate	4.86%
Current Dividend Yield	3.31%
Annualized St. Dev. of Stock Returns	26.23%

Range of Outstanding Options	Number of Shares	Average Exercise Price	Average Remaining Life (yrs)	B-S Option Price	Value of Options Granted
32.48 - 193.58	25	105.75	5.30	$ 50.46	$ 1,262
Total	25	$ 105.75	5.30	$ 70.30	**$ 1,262**

Texas Instruments Incorporated

Sensitivity Tables

DCF/EP — BETA

ERP \ BETA	134.01	1.00	1.05	1.10	1.15	1.20	1.25	1.30
4.69%		157.28	150.33	143.95	138.05	132.60	127.54	122.83
4.74%		155.75	148.86	142.53	136.68	131.28	126.26	121.59
4.79%		154.25	147.42	141.13	135.33	129.97	125.00	120.37
4.84%		152.78	146.00	139.76	134.01	128.69	123.76	119.17
4.89%		151.33	144.60	138.42	132.71	127.44	122.54	117.99
4.94%		149.91	143.23	137.10	131.44	126.21	121.35	116.84
4.99%		148.52	141.89	135.80	130.19	125.00	120.18	115.70

DCF/EP — Forecasted Marginal Tax Rate

Inflation \ Forecasted Marginal Tax Rate	134.01	11.98%	12.98%	13.98%	14.98%	15.98%	16.98%	17.98%
3.20%		140.50	138.91	137.30	135.69	134.07	132.45	130.82
3.40%		139.94	138.35	136.75	135.14	133.52	131.90	130.27
3.60%		139.38	137.78	136.18	134.58	132.97	131.35	129.72
3.80%		138.80	137.21	135.62	134.01	132.40	130.79	129.16
4.00%		138.22	136.64	135.04	133.44	131.83	130.22	128.60
4.20%		137.64	136.05	134.46	132.86	131.26	129.65	128.03
4.40%		137.05	135.46	133.87	132.28	130.68	129.07	127.45

DCF/EP — CV Growth of Company

WACC \ CV Growth of Company	134.01	5.73%	5.23%	4.73%	4.23%	3.73%	3.23%	2.73%
9.71%		179.27	164.13	152.03	142.14	133.91	126.95	120.98
9.81%		174.60	160.28	148.77	139.33	131.45	124.76	119.02
9.91%		170.16	156.59	145.64	136.63	129.07	122.65	117.12
10.01%		165.92	153.05	142.63	134.01	126.77	120.59	115.27
10.11%		161.87	149.67	139.73	131.49	124.54	118.60	113.47
10.21%		158.01	146.41	136.94	129.05	122.38	116.66	111.71
10.31%		154.31	143.29	134.25	126.69	120.28	114.78	110.01

DCF/EP — United States Growth Rate (2023 Est.)

China Growth Rate \ United States Growth Rate (2023 Est.)	134.01	7%	6%	5%	4%	3%	2%	1%
5%		150.90	150.65	150.41	150.16	149.91	149.66	149.42
1%		148.31	148.07	147.82	147.57	147.32	147.08	146.83
0%		147.67	147.42	147.17	146.93	146.68	146.43	146.18
-20%		134.75	134.51	134.26	134.01	133.77	133.52	133.27
-30%		128.31	128.06	127.81	127.57	127.32	127.07	126.83
-50%		115.43	115.19	114.94	114.69	114.45	114.20	113.95
-100%		83.37	83.12	82.88	82.63	82.39	82.14	81.90

DCF/EP — Pre Tax cost of Debt

Risk Free Rate \ Pre Tax cost of Debt	134.01	5.23%	5.33%	5.43%	5.53%	5.63%	5.73%	5.83%
4.56%		141.80	141.61	141.42	141.23	141.05	140.86	140.67
4.66%		139.30	139.11	138.93	138.75	138.57	138.38	138.20
4.76%		136.87	136.70	136.52	136.34	136.16	135.99	135.81
4.86%		134.53	134.36	134.18	134.01	133.84	133.67	133.50
4.96%		132.26	132.09	131.92	131.76	131.59	131.42	131.26
5.06%		130.06	129.90	129.73	129.57	129.41	129.25	129.09
5.16%		127.93	127.77	127.61	127.45	127.30	127.14	126.98

DCF/EP — SG&A % Sales

CoR % Sales \ SG&A % Sales	134.01	9.79%	10.12%	10.45%	10.78%	11.11%	11.44%	11.77%
26.44%		146.17	144.93	143.69	142.45	141.21	139.98	138.74
27.19%		143.35	142.11	140.88	139.64	138.40	137.16	135.93
27.94%		140.54	139.30	138.06	136.83	135.59	134.35	133.11
28.69%		137.73	136.49	135.25	134.01	132.77	131.54	130.30
29.44%		134.91	133.67	132.44	131.20	129.96	128.72	127.49
30.19%		132.10	130.86	129.62	128.39	127.15	125.91	124.67
30.94%		129.29	128.05	126.81	125.57	124.33	123.10	121.86