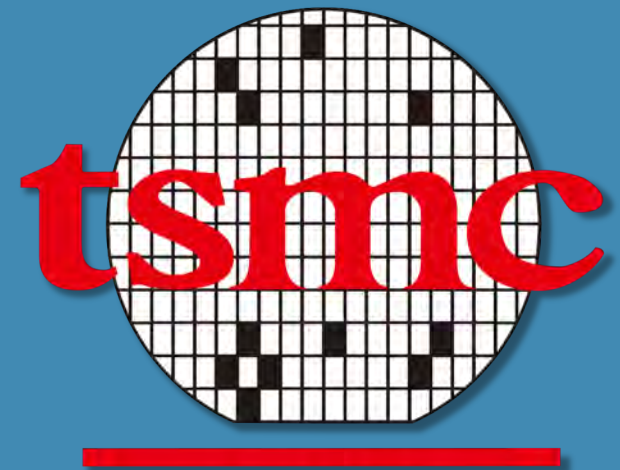


# Taiwan Semiconductor Manufacturing Company

Lead Analyst: Liam Hennessy

Analyst: Justin Pham

Analyst: Ferzan Budak

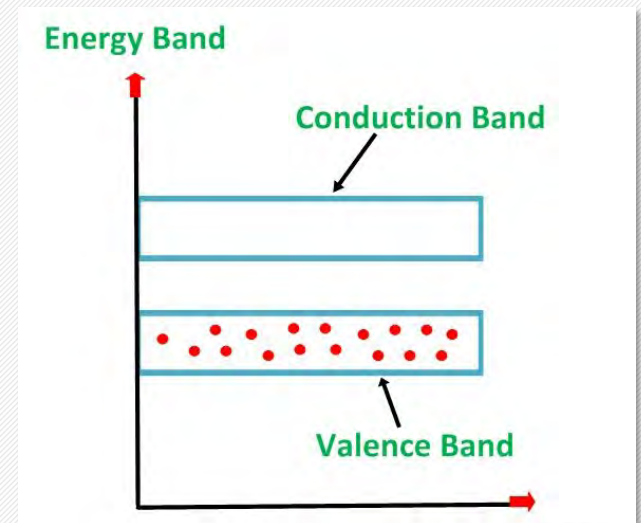
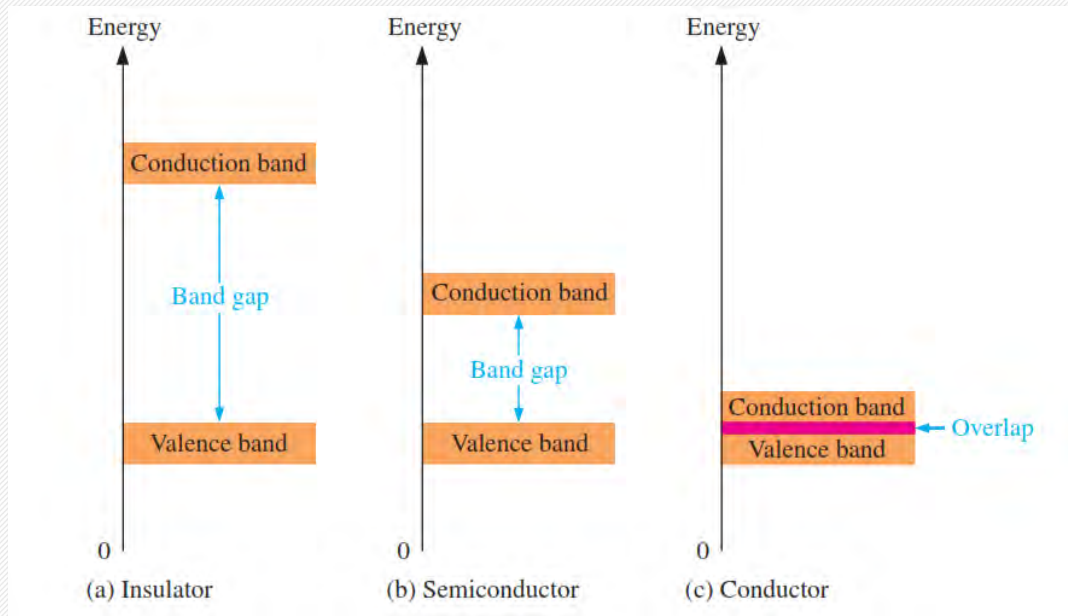


NYSE: TSM

**BUY**

Target Price \$104.24

# What is a semiconductor?



# Company Overview

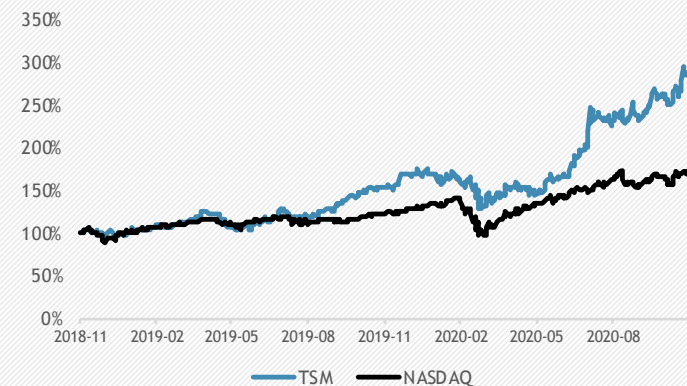


# Company Overview

- Founded in Taiwan in 1987 by Morris Chang. It is one of Taiwan's largest companies, the world's most valuable semiconductor company.
- Largest market share in semiconductor foundry market by 51.5%
- Foundry service provider for: Advanced Micro Devices (AMD), Apple Inc., Broadcom Inc., Marvell, MediaTek, Nvidia, etc.

<b>Ticker</b>	TSM
<b>Price (23/11/2020)</b>	98.13
<b>Market Cap</b>	456.39
<b>52 Week Range</b>	42.70 - 102.44
<b>52 Week Change</b>	77.33%
<b>PE Ratio</b>	44
<b>EPS</b>	2.23

2 Year Performance: TSM and NASDAQ

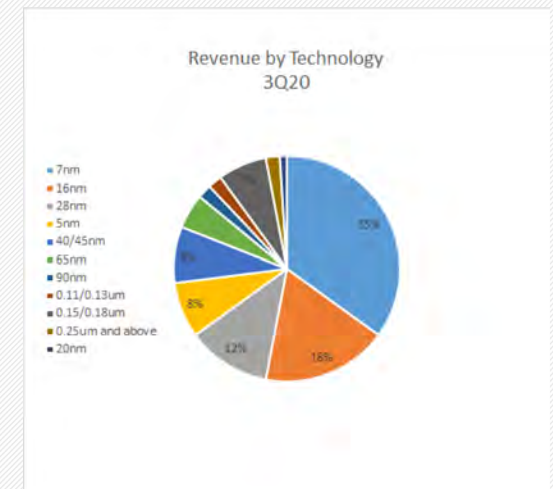
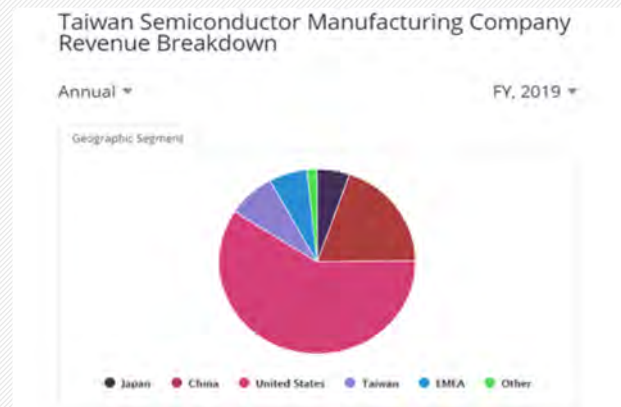
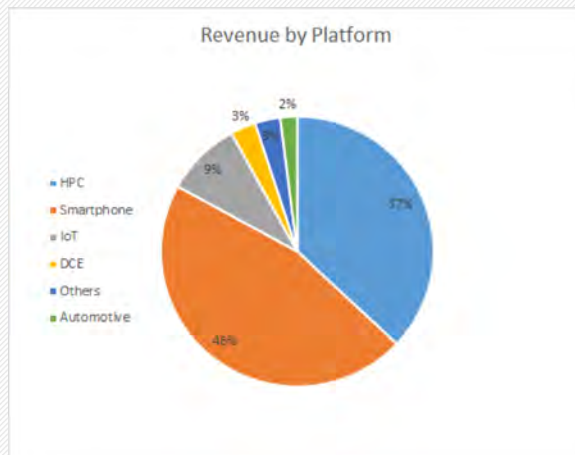


# Products

- **5nm process nodes** - This is TSM's highest demanded chip. In October 2020 TSMC revealed that 5nm nodes will be used in iPhones and
- **7 nm process nodes** - Currently, it's TSM's best-selling chip. TSMC was the first company that began manufacturing memory chips using a 7 nm process and is the industry dominator in this process
- **3nm process nodes** - This change in process nodes will create major changes in semiconductor industry. There will be 10-15% increase in performance, with a 25-35% decrease in power consumption. Only one other company besides TSM has been able to create a 3nm process. Samsung, however, Samsung has not announced that they will be able to bring the 3nm to market on a mass scale

# Revenue Breakdown

- Largely derives most of revenue from Smartphone platform; HPC being second
- Makes most of its revenue from the United States
- China being the second most
- Produces most revenue from its 7nm product
- 16, 28, and 5nm being the next most



# Executive Team



**Dr. C.C. Wei Chief Executive Officer**

- Received B.S. degree in electrical engineering from National Chia Tung University and PHD from Yale University.
- Prior to joining TSMC worked at Texas Instruments as a technical staff member in R&D.
- Served as TSMC's President and Co-CEO between 2013-2018
- Served as Senior Vice President of Business Development between 2009-2012



**Wendell Huang, Vice President, Finance and Chief Financial Officer**

- Received his B.B.A from National Chengchi University and his MBA from Cornell University
- Prior to joining worked at ING Barings, Chase Manhattan Bank and Bank of Boston
- Joined TSMC in 1999 and has led various projects including major bond issues in 2010-2013
- Over 30 years of work experience in finance



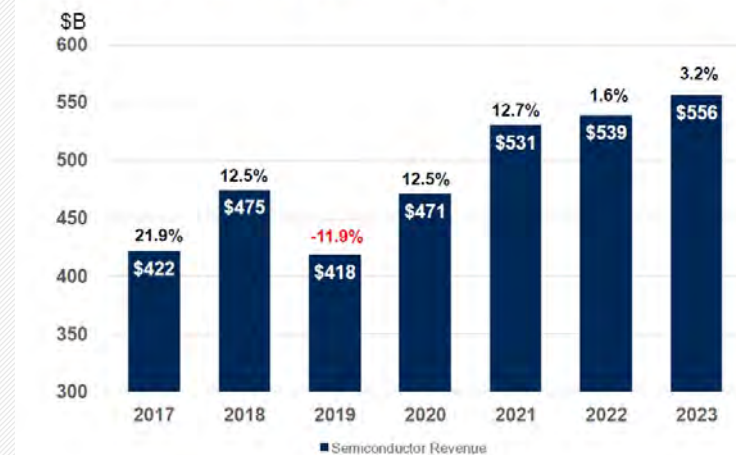
**Dr. Mark Liu, Chairman**

- Received his M.S. and PhD in degrees in electrical engineering and computer science from University of California, Berkeley
- Before joining TSMC, worked as a research manager at AT&T Bell Laboratory
- From 1983 to 1987, worked as process integration manager at Intel
- Over 35 years of experience in semiconductor/microprocessor industry

# Industry Overview

- Despite the drop in sales in 2019, the global semiconductor market is expected to grow by 12% in 2021
- Rapidly growing usage of AI will create a significant amount of revenue for semiconductor industry
- By 2022 expected revenue from AI-related semiconductors will be more than US \$30bn

Semiconductor Revenue





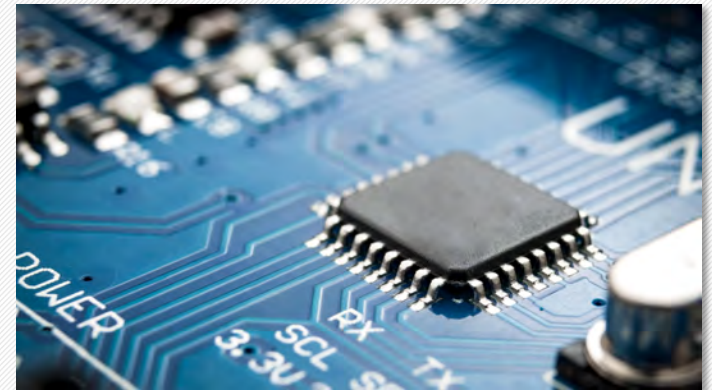
# Investment Thesis





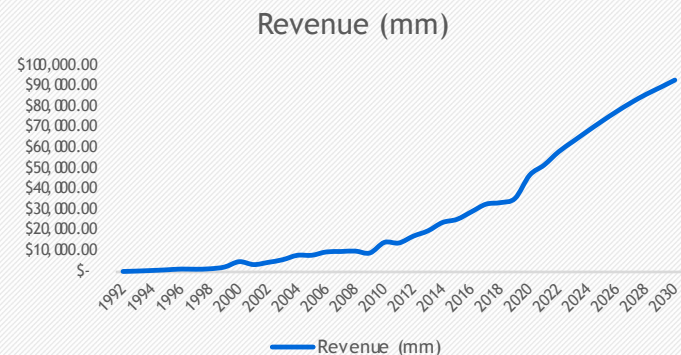
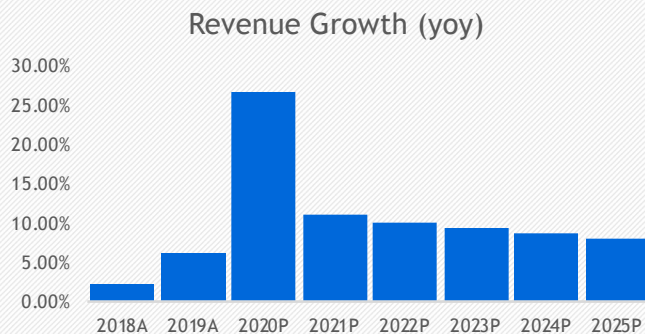
# Thesis 1 (cont.) - 7nm and 5nm process

- TSM currently manufactures processes from sizes 0.25um to 5nm
- They are the only manufacturer on a mass scale of a 5nm process semiconductor
  - This is important as they have perfected their art to such a degree that no other companies can compete
- Currently their best-selling processes are on the 7nm and 5nm
  - The 5nm would be their best selling as the demand is present however these processes are harder to make and they are in limited supply



# Thesis 2 - Strong Revenue Growth

- TSM has shown exceptional revenue growth YoY
  - Although it has been volatile, their average growth over the last 18 years was almost 22% annually
- With the innovation level they have been maintaining and the recent purchase of a new foundry to meet demand, there is no sign in the near future that they will slow down
- Additionally, more and more big companies have decided to switch TSM, and although the impact has been speculated, it has not been materialized

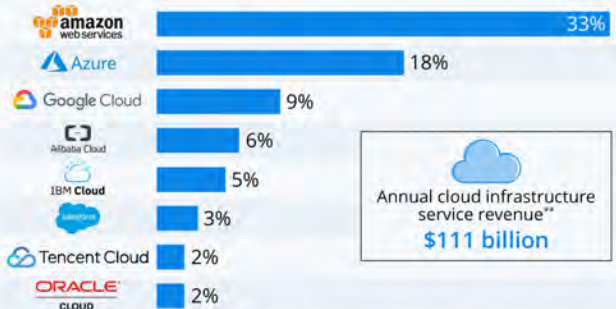


## Thesis 2 (cont.) - Revenue Growth - Cloud Computing

- Amazon's cloud computing, Amazon Web Services (AWS) is the largest cloud computing platform in the world
- AWS has recently decided to move their servers onto their custom ARM-based Graviton2
  - Their processors are manufactured on TSM's 7nm chip
- In order to stay competitive the rest of the cloud-computing industry will need to move to ARM (Advanced RISC [reduced instruction set computing] Management); currently the absolute vast majority of ARM chips run on TSM chips

### Amazon Leads \$100 Billion Cloud Market

Worldwide market share of leading cloud infrastructure service providers in Q2 2020\*



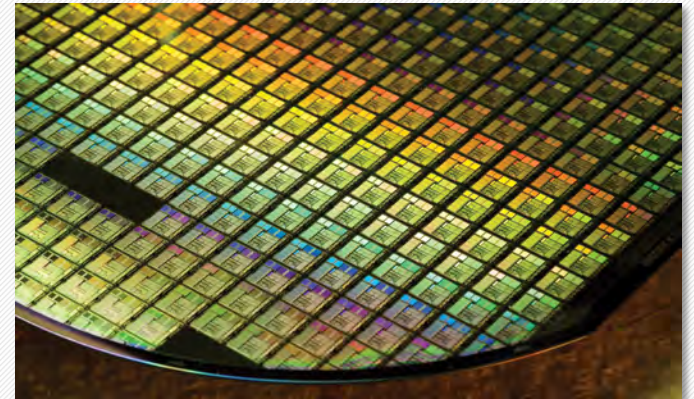
\* includes platform as a service (PaaS) and infrastructure as a service (IaaS) as well as hosted private cloud services

\*\* 12 months ended June 30, 2020

Source: Synergy Research Group

# Thesis 3 - Innovative Frontier

- TSM has promised a 3nm and 4nm process by 2022
  - Worth noting that they will likely bring the 3nm to market over the 4nm as it is the natural progression from the 5nm process
- The 3nm process will show a **power reduction** of about **25-30%** while **increasing performance** by about **10-15%**
- TSM is the only manufacturer to say they will be able to provide the 3nm process on a mass scale
  - Samsung has been able to create the 3nm process, but has not announced that they will be able to bring it to market on a mass scale



# **Risks & Mitigants; Catalysts**





# Risks & Mitigants

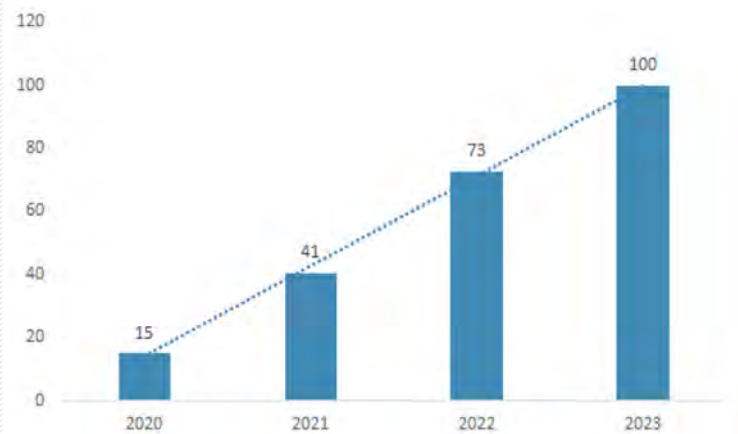
- **Risk:** COVID-19 may adversely affect their production levels globally, therefore decreasing overall sales and profitability
  - **Mitigant:** The COVID-19 vaccine and other positive news will ensure their reopening and realize the ability to produce the necessary semiconductors for customers
- 
- **Risk:** TSM highly relies on being able to obtain intellectual property and hold/enforce them in order to compete successfully and achieve future growth
  - **Mitigant:** There is a dedicated team towards protecting its intellectual property portfolio and has successfully done so for many years; spending many resources towards being able to hold onto its intellectual property
- 
- **Risk:** TSM operates in a highly competitive industry and may at times be unable to match prices of its competitors because of its manufacturing capacity, technology, and importing fees
  - **Mitigant:** With its new foundry in Phoenix, they can reduce costs to the United States amongst its large name customers like Apple and AMD by directly providing semiconductor chips in a central location without importing



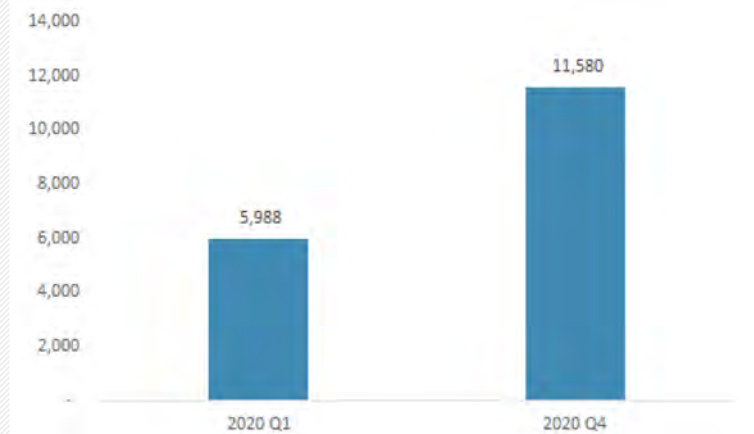
# Catalysts - 5G Chipset Provider

- The 5G smartphone market is growing exponentially, therefore increasing the demand for the 5nm chips that TSM provides
- Accelerating digital transformation requires faster semiconductor technology; giving TSM the opportunity to grow by providing more of their cutting-edge semiconductor technology

**Demand of 5G Smartphone Market (USA) (in millions)**



**Growth of Semiconductor End Market (in millions)**



# Valuation



# Valuation: Comps

Name	Ticker	Price	Mkt Cap (\$MM)	EV (\$MM)	Shares Out (MM)	P/E			EV/Sales			EV/EBITDA		
						TTM	2020	2021E	TTM	2020	2021E	TTM	2020	2021E
Taiwan Semiconductor	TSM	95.91	497,432	433,332	5186.1	27.99x	27.99x	26.68x	8.41x	9.68x	9.32x	13.04x	15.55x	14.25x
Intel Corp.	INTC	45.49	186,398	201,029	4098.0	9.35x	9.35x	10.03x	2.81x	2.90x	2.82x	5.95x	5.75x	6.04x
Nvidia Corp.	NVDA	525.43	325,241	322,783	619.0	54.23x	54.26x	45.20x	22.61x	16.78x	16.45x	65.95x	50.09x	40.66x
Qualcomm Inc.	QCOM	147.25	166,540	171,557	1131.0	20.89x	20.92x	18.81x	5.72x	5.71x	5.35x	17.29x	15.11x	14.34x
Broadcom Inc.	AVGO	385.88	156,089	195,654	404.5	17.51x	17.51x	15.28x	7.22x	7.65x	7.56x	16.30x	14.52x	13.05x
Texas Instruments	TXN	157.52	144,594	145,873	917.9	28.17x	28.16x	25.99x	9.63x	9.79x	9.65x	20.85x	22.41x	19.91x
STMicroelectronics NV	STM	36.65	33,391	27,642	911.2	34.82x	34.83x	23.73x	2.64x	3.00x	2.51x	12.36x	13.18x	10.36x
Mean						27.57x	27.57x	23.68x	8.43x	7.93x	7.67x	21.68x	19.52x	16.94x
Median						27.99x	27.99x	23.73x	7.22x	7.65x	7.56x	16.30x	15.11x	14.25x
Maximum						54.23x	54.26x	45.20x	22.61x	16.78x	16.45x	65.95x	50.09x	40.66x
Minimum						9.35x	9.35x	10.03x	2.64x	2.90x	2.51x	5.95x	5.75x	6.04x
Taiwan Semiconductor	TSM	95.905	497,432	433,332	5186.1	27.99x	27.99x	26.68x	8.41x	9.68x	9.32x	13.04x	15.55x	14.25x

EV/Sales Valuation			
	Bear Case	Base Case	Bull Case
Revenue	52,111.00	52,111.00	52,111.00
EV/Sales	7.67x	9.32x	12.34x
<b>Enterprise Value</b>	<b>399,526.69</b>	<b>485,860.21</b>	<b>642,839.24</b>
Add: Cash	25,497.90	25,497.90	25,497.90
Less: Debt	14,022.10	14,022.10	14,022.10
Less: Minority Interest	31.20	31.20	31.20
<b>Equity Value</b>	<b>410,971.29</b>	<b>497,304.81</b>	<b>654,283.84</b>
Shares Outstanding	5,186.08	5,186.08	5,186.08
<b>Equity Value per Share</b>	<b>\$ 79.25</b>	<b>\$ 95.89</b>	<b>\$ 126.16</b>
<b>Market Premium (Discount) to Fair Value</b>	<b>-17.37%</b>	<b>-0.01%</b>	<b>31.55%</b>

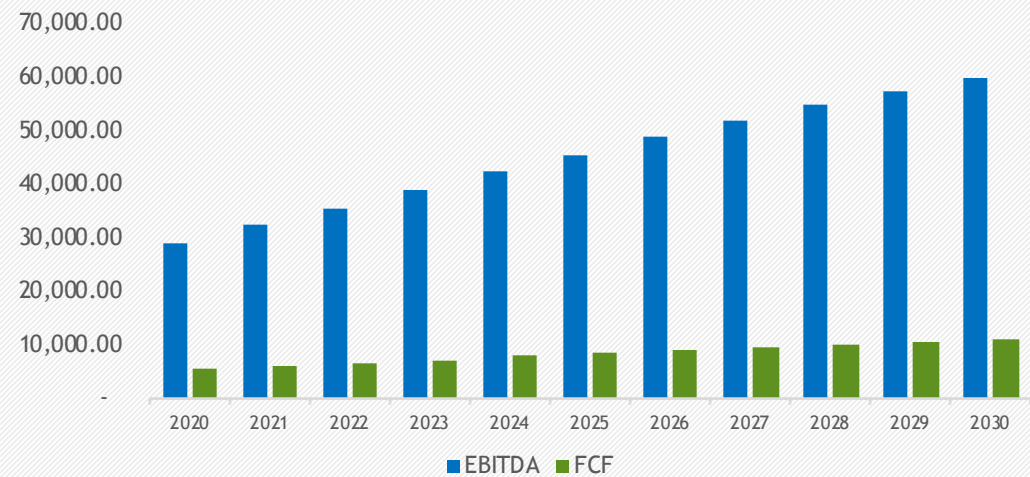


# Valuation: DCF

## DCF Summary

Long term growth rate	4.0%
2030 FCF	11,575
Terminal Year at 2030	847,672
<b>PV of Terminal Value</b>	<b>506,857</b>
PV of Growth Period	64,544
<b>Enterprise Value</b>	<b>571,401</b>
Less: Net Debt	(11,830)
<b>Equity Value</b>	<b>559,571</b>
Shares OS	5,190
<b>Equity Value Per Share</b>	<b>107.82</b>

Forward EBITDA, FCF (in millions)

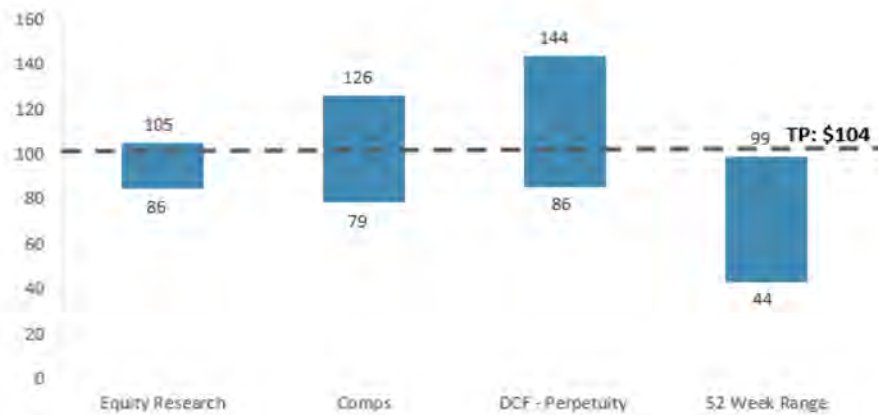


# Investment Recommendation

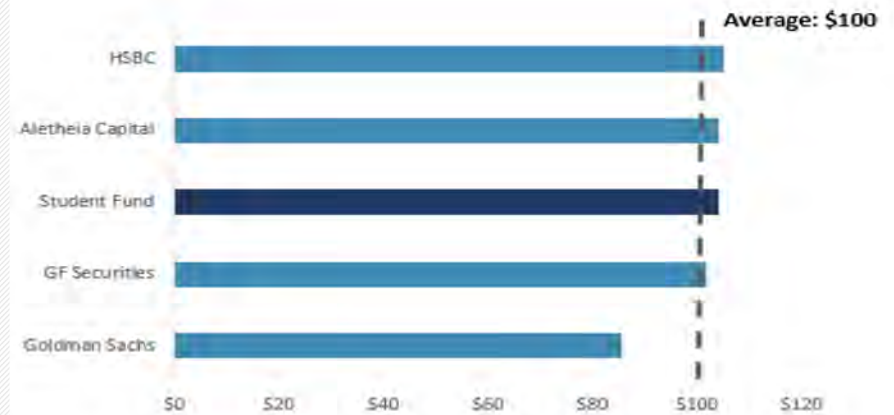


# Recommendation

## Valuation Football Field



## Street Estimates



## Valuation - Weighting

	Base Case TP	Weighting
DCF - Perpetuity Approach	107.82	70%
Comps - EV/Sales	95.89	30%
<b>Blended Target Price</b>	<b>\$ 104.24</b>	

# Appendix



# Inputs for DCF

Inputs	
Date of Valuation	2020-11-23
Operating Inputs in \$ million	
Revenue	45,357.6
EBITDA (Earnings)	29,073.7
Depreciation & Amotization	-
Capital Expenditures	20,327.2
Working Capital	15,245.5
Rate Inputs (%)	
WACC	5.4%
WACC Sensitivity	0.5%
Tax Rate	11.4%
Short Term Revenue Growth Rate	11.0%
Long Term Revenue Growth Rate (at end of valuation)	4.0%
<b>CapM</b>	<b>6.18%</b>
We	81.40%
Wd	18.50%
Re	6.18%
Rd	1.77%
<b>WACC</b>	<b>5.36%</b>