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EARNINGS QUALITY & DIVIDEND SUSTAINABILITY RESEARCH

BTN Research

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Taiwan Semiconductor Manufacturing (TSM) EQ Review

Current EQ Rating*	Previous EQ Rating
5-	na

6- "Exceptionally Strong"
5- "Strong"
4- "Acceptable"
3- "Minor Concern"
2- "Weak"
1- "Strong Concerns"

Note that a "+" sign indicates the earnings quality improved in the most recent quarter while a "–" sign indicates deterioration

*For an explanation of the EQ Review Rating scale, please refer to the end of this report

We initiate earnings quality coverage with a 5- (Strong) rating

The company is one of the largest semiconductor producers in the world and Apple is its top customer. The ADS represents five ordinary shares trading in US Dollars. The company's balance sheet is clean with cash net of debt equal to six-months of cash flow. Working capital does not appear to have problems with receivables at normal levels with fast collection and they are not stretching payables for cash.

The biggest issue we see with regard to earnings quality involves the significant capital spending and the timing and speed of depreciation. In recent quarters, TSM beat estimates and we believe this was the primary cause. The company appears poised to see some of that reverse in the near term as new plants come online with higher depreciation running through the income statement. Those higher costs also flow into inventory. That is why we are giving it a minus rating at this time. However, in the long-run, we believe TSM's strong commitment to growth investing and results are solid albeit lumpy at times. That is the reason for the 5 (Strong) rating.

- Growth investing in capital spending is very high. Capital spending routinely is greater than depreciation, which helps future sales, but crimps current free cash flow. In recent years, the lowest ratio of capital spending to cash from operations has been 55% and it's often 30%-40% of sales.

- TSM has the balance sheet to support this in our view. It has a large net cash balance and it is committed to paying a cash dividend. The coverage is getting tighter and TSM may not grow the dividend as much in the future.

- **The huge capital spending becomes rising depreciation. In 2019, TSM modified its depreciation schedule for machinery and equipment from 2-5 years to 5-years. That helped create a period where depreciation fell in 2019 and in early 2020, which helped EPS.** We believe the recent EPS beats of 6-cents in 2019, 6-cents in 1Q20, and 7-cents in 2Q20 are partially due to the change in depreciable life assumptions.

- The company's guidance coming into 2020 was high-teen growth for depreciation and it is sticking to that forecast after 2Q's results. With depreciation down y/y in 1H20 – that indicates this could be a sizeable earnings headwind for the next few quarters.

- **Equipment under Installation is part of PP&E, but it is not depreciated until it becomes operational. This reached 39% and 42% of PP&E in 4Q19 and 1Q20. That meant assets being depreciated were flat to down. That helped depreciation expense decline in recent periods. At the end of 2Q20, the EUI dropped to 10% of PP&E so a large amount of new equipment is now subject to depreciation.**

- **Deprecation is 21%-25% of sales so it has a sizeable impact on changes in gross margin.** Gross margin has moved in a range of about 700bp with 400bp due to depreciation. New equipment and technology normally boosts volumes and allows these huge fixed costs to be spread over more chips. However, often when first starting up, the huge fixed costs arrive first and the inventory and sales arrive on a lagged basis – which can also hurt gross margin in the short-run. As factory utilization falls, fixed costs do not decline, and inventory production costs per unit increase.

- **Inventory is impacted by these changes in depreciation and operating levels.** Inventory DSIs are normally about 50 days – and it is there now. However, there were several quarters in late 2018-early 2019 when DSIs were above 70 days. That was the result of having lower sales and fixed costs per unit increase.

- We view some of this as timing issues more than aggressive accounting. Overall, starting new facilities and supplying high-end chips and producing more volume to spread the fixed costs over is a good thing. Early on, the benefits may not be seen as fixed costs show up first.

- TSM does look to adjust inventories to the lower of cost or fair market value at times when utilization is at or below normal levels. There have been several adjustments over the years. However, the inventory turns fast enough and two-thirds of inventory is normally work-in-progress so the marks have been immaterial in our view.

- TSM also invests heavily in R&D – generally 8% of sales or higher. We view this as more commitment toward future sales. The minor fluctuations as a percentage of sales have more to do with sales changing than R&D being raised or lowered. We are seeing it rise each year.

TSM Spends Heavily on Capital Spending – Which Supports Growth

As a foundry, TSM is an asset-heavy business. It is supplying customers who in turn are using TSM semiconductors in the newest cellphones, 5G infrastructure, data centers, etc. Thus, technology changes fairly rapidly. As a result, TSM needs to continually upgrade its production facilities to incorporate newer technology – emphasizing smaller sized chips with more capacity and faster speeds. Investing in that manner allows TSM to retain customers.

As a result, the capital spending is very high at TSM:

(Bills of NT$)	2Q20	1Q20	2019	2018	2017	2016
Sales	310.7	310.6	1070.0	1031.5	977.0	947.9
Cash from Ops	170.3	203.0	615.1	574.0	585.3	539.8
Capital Spend	126.7	192.6	460.4	315.6	330.6	328.0
Free Cash Flow	43.6	10.4	154.7	258.4	254.7	211.8
Dividend	64.8	64.8	259.3	207.4	181.5	155.6
Cap-Ex % Sales	40.8%	62.0%	43.0%	30.6%	33.8%	34.6%
Cap-Ex % CFO	74.4%	94.9%	74.8%	55.0%	56.5%	60.8%

Capital spending also consistently exceeds depreciation. This also shows that TSM reinvests heavily in the business plus invests further to support growth. We think it also means that depreciation is essentially a cash expense because of the cash shortfall between the two figures:

(Bills of NT$)	2Q20	1Q20	2019	2018	2017	2016
Depreciation	69.0	67.1	281.4	288.1	255.8	220.1
Capital Spend.	126.7	192.6	460.4	315.6	330.6	328.0

We want to point out upfront that TSM's balance sheet is not leveraged. It has a net positive cash position less all financed debt of 353 billion NT - or about 6-months of cash flow. It turns its receivables over quickly too. The company is committed to paying its dividend "*TSMC intends to maintain a sustainable quarterly cash dividend, and to distribute the cash dividend each year at a level not lower than the year before.*" Of late, the cushion to pay the dividend is tighter and it may not grow at past rates and could see more periods of flat payouts.

We think this heavy capital spending does have some large impacts on operating results.

Depreciation Has Several Impacts on Earnings – New Assumptions Helped Recent EPS Grow

TSM depreciates all the is equipment very rapidly. Here is a breakdown by asset category:

(Bills of NT$)	Gross	Deprec	Net	% of Net	Dep Life
Land & Improve	4.0	0.5	3.4	0.2%	20 years
Buildings	503.8	255.6	248.2	16.6%	10-20 years
Machinery/Eq	3455.5	2390.4	1065.1	71.3%	5 years
Office Eq	63.6	40.4	23.2	1.6%	5 years
EUI/CIP	153.6	0.0	153.6	10.3%	n/a
Total	4180.5	2686.9	1493.5	100.0%	

- EUI/CIP is Equipment Under Installation and Construction in Progress – it is not depreciated until it is in operation.

The bulk of assets are machinery and equipment being amortized over only 5 years. We agree that is very conservative. However, investors should realize that TSM changed its depreciation schedule to lengthen it in 2019. Prior to 2019, machinery was depreciated over 2-5 years. Office equipment was being depreciated over 3-5 years but changing that to 5-years is less consequential.

If we look at depreciation and net PP&E in recent years, we believe TSM has been gaining income from this change in depreciation lives:

(Bills of NT$)	2Q20	1Q20	2019	2018	2017	2016
Net PP&E	1493.6	1438.2	1352.4	1072.1	1062.5	997.8
Depreciation	69.0	67.1	281.4	288.1	255.8	220.1

- In 2019, net PP&E rose 26% and Depreciation fell 2%. We think some of this is due to the change in accounting assumptions. We will explore below the timing of when depreciation commences that also played a role as well. TSM beat estimates by 6-cents on the ADS during 2019. We estimate that had depreciation remained flat in 2019, it would have cost the ADS about 1.8% of EPS or 4-cents. If depreciation had increased by 10%, we estimate that would have cost the ADS about 9.4% of EPS or 21-cents. We consider this a material benefit to the accounting change.

- The company also gave guidance after 4Q19 to expect depreciation growth in the high teens for 2020. So far, depreciation is running lower y/y and is not even on pace to match the reduced level of 2019.

(Bills of NT$)	2Q20	2Q19	1Q20	1Q19
Depreciation	69.0	73.7	67.1	76.2

TSM beat by 6-cents in 1Q20 and 7-cents in 2Q20.

- In 1Q20, the decline in deprecation y/y added 6.9% to income or 5-cents for the ADS. If we assume at 16% increase in deprecation y/y per guidance of high-teens growth, that could have cut EPS by 12-cents. There is not much discussion on this in detail in the results or on the earnings calls. So, we would ask readers to treat this 5-12 cents as a potential range of recent positive EPS.

- In 2Q20, the decline in deprecation y/y added 3.5% or 3-cents for the ADS. Again, if depreciation had risen 16%, it would cut EPS by 9-cents.

- **We want to point out that on the 2Q20 call – TSM affirmed its guidance for depreciation for 2020 to be much higher y/y.** ***"our current estimate on 2020 depreciation year-on-year growth is still high teens growth. So that gives you an idea of what the second half depreciation will be. It will be higher than the first half."*** **That could create a headwind for 2H20 in our view.**

Equipment Under Installation Drives the Depreciation Figure

In the first table above, we noted that after 2Q20, 10% of the net PP&E was considered as Equipment Under Installation or Construction in Progress. These parts of PP&E are not yet being depreciated. The company says that depreciation begins when the assets are available for use and in the condition necessary for assets to be capable of operating in the intended manner. What happens is assets move from the EUI section of PP&E to the machinery section.

In addition to watching the amount of Capital Spending and the trend in Depreciation, investors should be watching this EUI account to see how many assets are actually subject to depreciation at the moment. Looking at recent results, some of the drop in depreciation could be foreseen:

(Bills of NT$)	2Q20	1Q20	2019	2018	2017	2016
EUI/CIP	153.6	606.5	528.3	172.9	167.4	387.2
Net PP&E	1493.6	1438.2	1352.4	1072.1	1062.5	997.8
assets to be depreciated	1340.0	831.7	824.1	899.2	895.1	610.6
Growth	57.5%	4.1%	-8.4%	0.5%	46.6%	
Depreciation	69.0	67.1	281.4	288.1	255.8	220.1
Growth	-6.4%	-11.9	-2.3%	12.6%	16.2%	

From 2017-19, the net assets installed and being depreciated were flat to down. The depreciation had to catch up to all the 2016 assets under construction becoming active in 2017 and 2018 and depreciation rose. In 2019, depreciation was helped by lengthening the asset lives as well as a lower asset total remaining to expense. That is why we gave a range of what the impact from stretching depreciation lives for assets was in the section above for recent periods. There is some impact from the change in policy and there is some impact from having a flat total of undepreciated assets.

A huge amount of new installation that was seen in 2019 and 1Q20, just moved to the machinery section and is ready to begin depreciation. So, assets subject to depreciation just rose 57.5% y/y in 2Q. That is more reason why investors should expect TSM is being truthful that its depreciation figure will rise considerably in 3Q20 and 4Q20.

Depreciation on Inventory and Gross Margin

Depreciation is a huge fixed cost for TSM. The bulk of it goes through Cost of Sales. Thus, it makes up part of the total expense that produces inventory. Plus, a fluctuating gross margin is often influenced by the depreciation figure. Plus, **TSM notes that gross margin is often negatively impacted when new technology production is introduced. This is due to the depreciation starting immediately as a fixed cost while the production of finished products ramps up and subsequent sales happen after the depreciation begins.**

Gross Margin	2Q20	1Q20	2019	2018	2017	2016
Adj Gross Margin	53.1%	51.7%	46.2%	48.7%	50.5%	50.5%
COGS Dep % Sales	20.1%	19.6%	24.0%	25.7%	24.1%	21.5%
Non-Dep GM	33.0%	32.1%	22.2%	23.0%	26.4%	29.0%

- Adjustments are minor marks to fair value for inventory

The total gross margin has moved within a range of 7-percentage points in recent years with depreciation accounting for about 4-percentage points of that move (leaving out the first half of 2020). We are pointing this out because with the figures for assets to be depreciated jumping significantly in 2Q20 – it seems likely depreciation as a percentage of sales will push down gross margin going forward.

The operating model is to have new technology boost the volume of inventory and spread that higher volume over fixed costs and reduce the per-unit production costs. That also requires the utilization rate of the facilities to be a high figure. As the utilization rate increases – it lowers unit costs by spreading fixed costs over more output and tends to boost gross margin. The reverse is also true. In 2019, there were a few points that hurt utilization particularly in the first half of the year – wafer contamination and a seasonal drop-off in smartphone demand as a key end market. Thus, 2020 has not only benefited from those issues vanishing and posting a higher utilization rate against a poor year but it also benefitted from the decline in depreciation expense discussed earlier. We only see TSM report actual percentages for utilization in annual filings:

	2Q20	1Q20	2019	2018	2017	2016
Utilization	up	up	81%	87%	91%	92%

We can also track this with DSIs for inventory. When sales are lower, the cost of producing inventory rises and DSI increases even if COGS follow sales down:

in bills of NT	2Q20	1Q20	4Q19	3Q19
Sales	310.7	310.6	317.2	293.1
COGS	146.1	149.8	158.0	153.6
Inventory	85.8	78.3	83.0	96.7
DSI	53.6	47.7	48.0	57.5

in bills of NT	2Q19	1Q19	4Q18	3Q18
Sales	241.0	218.7	289.8	260.3
COGS	137.3	128.3	151.7	137.0
Inventory	108.2	108.7	103.2	105.3
DSI	71.9	77.3	62.1	70.1

in bills of NT	2Q18	1Q18	4Q17	3Q17
Sales	233.3	248.1	277.6	252.1
COGS	121.7	123.2	138.8	126.2
Inventory	99.0	85.2	73.9	73.9
DSI	74.2	63.1	48.6	53.4

To sum this up – the first half of 2020, TSM had solid earnings driven by higher sales and lower inventory costs that were fueled further by lower depreciation and higher utilization. Gross margin rose 10-percentage points and the company beat forecasts handily. Going forward, we are not making a call on sales. However, we believe new equipment starting up will boost inventory costs and depreciation, which will pressure margins.

We should add that some of this represents timing issues related to recognizing higher fixed costs as sales will lag for new products in periods of starting up new production. We don't consider this to be aggressive accounting. In fact, even after stretching the property lives modestly in 2019 and gaining some EPS, we really cannot take TSM to task over a 5-year life expectancy for new machinery. The issue to focus on is that in any period of time, the depreciation and capital spending figures are big enough to materially influence the results in a positive or negative manner because they so directly impact gross margin and the value of inventory.

Inventory Adjustments Happen – But Have Been Largely Immaterial

In recent years, the company has had issues with an earthquake destroying some inventory, a computer virus, and some wafer contamination that led to some write-offs. In addition, when it has periods of operating at or below normal capacity levels – the fixed costs are spread over fewer units which boosts the cost of inventory units. During those times, TSM seeks to ensure that the inventory is carried at the lower of cost or fair market value. Fair market value is estimated against selling prices and the time horizon is very short – less than 180 days. There have been adjustments for this at times as well. Many times, the adjustment to inventory valuation has been partially reversed.

In order to cost TSM 1-cent in EPS on the ADS, a charge needs to be about 1.5 billion NT$ +/- 0.1 billion depending on the exchange rate for the US$ to NT$. These charges have not been that large in recent years:

Inv. Adj.	2Q19	1Q19	2019	2018	2017	2016
Inv. to FMV	0.5	-0.2	-2.0	1.3	-0.8	1.5
Outside event	0.0	0.0	3.4	2.6	-0.1	2.5
Total	0.5	-0.2	1.4	3.9	-0.9	4.0

- Outside events are – contamination of wafers, computer virus, revaluated loss of earthquake and earthquake damage for years 2019-16.

We think most investors would consider the outside events to be 1-time items and ignore them even they were larger. On the adjustments to FMV, we think these tend to stay low because inventory turns over fairly quickly and the bulk of inventory is work in progress which should have a lower starting value than finished goods as part of the FMV adjustment process:

Inventory	2Q19	2019
Finished Goods	8%	11%
Work in Progress	66%	63%
Raw Materials	18%	20%
Supplies	9%	7%

Inventory Turnover for the last three years has been between 1.2-1.9x per quarter with an average of 1.5x per quarter. Currently, the inventory levels are low at just over 50 days.

TSM Spends Heavily on R&D Also

R&D has dipped a tad as a percentage of sales in 2020. We think that is more of a function of weaker sales in early 2019. The amount of spending continues to increase.

	2Q20	1Q20	2019	2018	2017	2016
R&D	24.9	25.0	91.4	85.9	80.7	71.2
% Sales	8.0%	8.0%	8.5%	8.3%	8.3%	7.5%

It could be possible for TSM to grow R&D spending faster than sales in short periods of time like in 2019. Had 2019's spending stayed at 8.3% it would have only produced about 1.7 cents in additional EPS. We're going to give TSM credit for staying the course and having the liquidity to plan further ahead and live with a small amount of lumpiness on earnings.

Receivables and Payables Look Fine Too

TSM is not having problems with receivables or tapping payables for cash either. We're seeing rapid collections and payment of both:

	2Q20	1Q20	4Q19	3Q19
A/R DSOs	43.9	43.0	40.2	45.2
A/P DSPs	24.7	24.2	23.2	22.0

	2Q19	1Q19	4Q18	3Q18
A/R DSOs	44.0	44.5	40.7	45.4
A/P DSPs	21.7	19.7	20.7	20.2

	2Q18	1Q18	4Q17	3Q17
A/R DSOs	35.5	39.7	40.2	43.0
A/P DSPs	23.0	21.5	19.8	21.0

Explanation of EQ Rating Scale

6- "Exceptionally Strong"	Indicates uncommonly conservative accounting policies to the point that revenue and earnings are essentially understated relative to the company's peers. Higher possibility of reporting positive earnings surprises
5- "Strong"	Indicates the company has no areas of concern with its reported results and we see very little risk of the company disappointing due to recent results being overstated from aggressive reporting in recent periods.
4- "Acceptable"	Indicates the company may have exhibited a minor “red flag”, but the severity of the issue is not yet a concern. Minimal risk of an earnings disappointment resulting from previous earnings or cash flow overstatement
3- "Minor Concern"	Indicates the company has exhibited either a larger number of or more serious warning signs than companies receiving a 4. The likelihood of an immediate earnings or cash flow disappointment is not considered to be high, but the signs mentioned deserve a higher degree of attention in the future.
2- "Weak"	Indicates the company’s recently reported results have benefitted materially from aggressive accounting. Follow up work should be performed to determine the nature and extent of the problem. There is a possibility that upcoming results could disappoint as the impact of unsustainable benefits disappears.
1- "Strong Concerns"	Indicates that the company’s recent results are significantly overstated and that we view a disappointment in upcoming quarters is highly likely.

In addition to the numerical rating, the EQ Review Rating may also include either a minus or plus sign. A minus sign indicates that our analysis shows the overall earnings quality of the company has worsened since the last review and there is a possibility the numerical rating will fall should the problem continue into the next quarter. Likewise, a positive sign indicates that the overall earnings quality is improving, and the company may see an upgrade in its numerical rating should the trend continue.

Key Points to Understand About the EQ Score

The EQ Review Rating is much more than a blind, quantitative scoring method. While we utilize proprietary adjustments, ratios, and methods developed over decades of earnings quality analysis, the foundation of all of our analysis is reading recent SEC filings, press releases, conference call transcripts and in some cases, conversations with managements.

The EQ Review Rating is not comparable to a traditional buy/sell rating. The Rating is intended to specifically convey the extent to which reported earnings may be over/understated. Fundamental factors such as forecasts for future growth, increasing competition, and valuation are not reflected in the rating. Therefore, a high score does not in itself indicate a company is a buy but rather indicates that recent results are a good indication of the underlying earnings and cash generation capacity of the company. A low score (1-2) will likely result in us performing a more thorough review of fundamental factors to determine if the company warrants a full-blown sell recommendation.

Disclosure

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