

出國報告(出國類別：研究)

## 人工智能在債券投資領域之應用

服務機關：臺灣土地銀行股份有限公司

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派赴國家/地區：英國

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## 摘要

本次出國研習，藉由透過親訪英國金融機構，瞭解如何運用人工智能相關平臺，對其多元之債券投資進行管理及監控，迅速反應外部訊息及即時應變之能力，以做為本行未來考慮引入智能相關平台，並降低本行債券部位風險之參考。

根據此次參訪的同業結果，發現國際大型銀行已積極投入相關平台的開發，近期亦吸引許多智能平台開發公司對投資、交易、風險管理等領域積極開發相關平台，經本此參訪，發現智能平台開發公司之平台主要應用於投資前巨量研究資料整合，以及投資後即時監控之風險管理，未整合至交易端，且目前相關智能平台費用昂貴，惟隨著 AI 應用日趨成熟且設備成本降低，未來將吸引更多國內公司投入開發較具經濟型之智能平台，提高使用者使用意願。

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## 一、目的

金融科技(finance technology, 簡稱 FinTech)是指隨著科技的新興與發展,金融產業公司紛紛採納科技的力量解決其高人力成本的業務,進而形成的一種經濟產業。其中人工智能(artificial intelligence, 簡稱 AI)在金融業的應用亦備受關注,2017年,北歐最大的銀行北歐聯合銀行(Nordea Bank AB)因需要降低成本並提升效率,引入 AI 技術,因而大幅削減員工人數,整體裁員 6,000 人,減低成本後讓 Nordea 在 2018 年第 2 季達成了 31%的營利年增長率,成為瑞典四家銀行中成績最亮眼的一家,股價在 2018 年也出現極佳的表現。

金融業的本質就是數字,而擅長處理數字資訊的 AI 亦快速發展至金融業,應用層面也相當廣泛,人工智能在投資研究的運用上,主要是利用大數據和機器學習,將資料轉化為資訊並進行決策的智能整合。全球最大的資產管理公司貝萊德(BlackRock)在 2017 年 3 月 28 日宣佈,將裁掉超過 40 個主動型基金部門的員工崗位,其中包括 7 名投資組合經理,轉而用機器人代替,現在一些基金的運作已經利用人工智能做為其投資交易過程的部分甚至全部的投入。

而在投資組合管理的部分,人工智能與機器學習等工具可被用於辨識價格波動的訊號,並且更有效的使用巨量的市場研究資料,其運作原理事實上與系統性投資方法相同,一樣是從資料中進行價格或者波動度變化的預測,在不同的投資期間中創造出具有更高報酬但低相關度的投資組合,目前業界普遍看法認為,要讓人工智能與機器學習更有效利用的話,交易單位與量化人員需要更密切的合作且深度的瞭解這項新工具。

本次執行 112 年出國研習計畫「人工智能在債券投資領域之應用」,期藉由透過親訪英國金融機構,察訪國外金融機構尤以大型銀行,瞭解先進國家銀行第一線

交易人員如何運用人工智能相關平臺，對其多元之債券投資進行管理及監控，迅速反應外部訊息及即時應變之能力，以做為本行未來考慮引入智能相關平台，有效管理及降低本行債券部位風險之參考。

## 二、過程

本次出國研習計畫自 112 年 9 月 11 日出發前往英國倫敦，112 年 9 月 28 日返抵國門，行程共計 18 日。期間參訪英商匯豐銀行(HSBC)、英商國民西敏市銀行(NatWest)、美商摩根大通銀行(J.P. Morgan)、美商花旗銀行(CitiBank)等 4 家國際性大型銀行。

本次參訪 4 家銀行之訪談人員，多為固定資產產品銷售人員、交易部門主管及交易員，主要訪談議題包括：

- (一)主要國家經濟之展望。
- (二)主要國家利率之展望。
- (三)如何加入運用智能平台進行債券部位管理及監控。

本次亦參訪對象包括提供智能平台之標準普爾市場財智公司(S&P Global Market Intelligence)，進行試用該公司開發之 Capital IQ platform，熟悉及瞭解該平台如何運用於債券部位之管理及監控。

### 三、心得及建議

#### 1、主要國家經濟及利率展望

本次參訪之國際大行大多認為，在美、歐、英央行因通膨壓力高而大幅升息後，通膨率已開始回降，政策利率將逐漸高於通膨率，實質政策利率轉為正值，政策利率已具限制性(restrictive)，對經濟活動、勞動市場及通膨均將產生抑制效果，美、歐緊縮貨幣之累積效果應會持續發酵，使經濟成長承壓，惟勞動市場仍緊俏致核心通膨率緩降，通膨率仍高於央行目標，主要央行未來將持續依據經濟數據(data-dependent)決定合適的政策利率路徑，為避免通膨預期再度升溫，預期高利率仍將維持一段時間，明(2024)年在供需趨向平衡後，Fed 及 ECB 可能開始有降息機會。

不過仍需持續關注，1. 主要央行緊縮貨幣政策之累積效應影響全球經濟及金融穩定、2. 中國大陸經濟成長放緩，拖累全球經濟成長、3. 全球經濟零碎化及供應鏈重組影響全球經貿發展，以及 4. 氣候變遷加劇大宗商品供應風險，地緣政治風險升高恐再推升大宗商品價格，一系列下行風險。

#### 2、智能平台運用於債券部位之管理及監控

本次參訪之匯豐銀行(HSBC)、國民西敏市銀行(NatWest)、摩根大通銀行(J.P. Morgan)、花旗銀行(CitiBank)等 4 家銀行，其中匯豐銀行、摩根大通銀行及花旗銀行，因屬國際性大行其部位監控平台，為易於整合全球據點部位，另外搭配交易系統可立即執行交易，因此皆為自行開發系統，另國民西敏市銀行(NatWest)規模較小，其採用與外部廠商合作開發之軟體進行監控。

以下介紹本次參訪標準普爾市場財智公司(S&P Global Market Intelligence)，試用該公司開發之 Capital IQ platform 之內容。

# S&P Capital IQ platform 介紹及使用

## (一) 債券投資組合部位監控

### 1. 債券投資組合部位監控-股價(List Monitoring-stock performance)

S&P Capital IQ <sup>PRO</sup> Search S&P Capital IQ Pro (CTRL + SHIFT + F) Q Advanced Search

Apps ▾ Dashboard RatingsDirect® ▾ Research ▾ Markets & Deals ▾

**Market Monitor** Markets **List Monitoring** Portfolio List Performance +

TICKER	ENTITY NAME	LAST PRICE	LAST TIME	NET CHG (\$)	CHG (%)	VOLUME (ACTUAL)	AVERAGE DAILY	YTD HIGH (\$)	YTD LOW (\$)	52 WEEK HIGH (\$)	52 WEEK LOW (\$)
SEHK:2318	Ping An Insurance (Group) Company of China, Ltd.	7.19	8:00:00 PM...	0.00	0.00%	25,670,060	28,188,040	8.32	8.16	8.32	4.0
TWSE:2330	Taiwan Semiconductor Manufacturing Company Li	17.21	8:00:00 PM...	0.00	0.00%	45,104,840	22,579,869	17.73	17.64	18.19	12.0
SEHK:700	Tencent Holdings Limited (SEHK:700)	43.41	8:00:00 PM...	0.00	0.00%	34,412,000	21,420,342	53.22	52.25	53.22	25.3
TSE:7203	Toyota Motor Corporation (TSE:7203)	14.16	8:54:00 AM...	0.00	0.00%	6,903,100	23,904,898	14.17	14.02	16.36	12.7
TSE:8306	Mitsubishi UFJ Financial Group, Inc. (TSE:8306)	6.78	8:54:00 AM...	0.00	0.00%	23,028,100	84,164,818	7.21	7.09	7.21	4.5
KOSE:A005	Samsung Electronics Co., Ltd. (KOSE:A005930)	51.02	8:54:00 AM...	0.00	0.00%	7,988,464	12,692,970	49.82	49.15	51.47	38.7
NasdaqGS:	Apple Inc. (NASDAQGS:AAPL)	175.05	8:00:00 PM...	0.00	0.00%	65,232,060	58,285,961	175.24	172.58	176.15	124.1
NasdaqGS:	Amazon.com, Inc. (NASDAQGS:AMZN)	118.15	8:00:00 PM...	0.00	0.00%	70,411,600	60,623,220	118.60	116.34	146.57	81.4
LSE:AZN	AstraZeneca PLC (LSE:AZN)	148.68	8:00:00 PM...	0.00	0.00%	1,230,986	1,934,173	153.82	150.47	153.82	116.6
LSE:BATS	British American Tobacco p.l.c. (LSE:BATS)	32.97	8:00:00 PM...	0.00	0.00%	5,386,430	4,091,543	41.90	41.37	45.25	32.8
ASX:BHP	BHP Group Limited (ASX:BHP)	29.27	8:54:00 AM...	0.00	0.00%	2,361,095	NA	33.20	32.79	33.20	23.6
LSE:BP	BP p.l.c. (LSE:BP)	5.97	8:00:00 PM...	0.00	0.00%	35,282,420	57,858,317	7.08	6.92	7.08	4.4
NYSE:C	Citigroup Inc. (NYSE:C)	46.39	8:00:00 PM...	0.00	0.00%	17,586,920	18,987,487	53.23	52.01	54.56	40.0
LSE:DGE	Diageo plc (LSE:DGE)	43.88	8:00:00 PM...	0.00	0.00%	3,063,657	3,769,862	47.04	46.39	49.16	41.7
NasdaqGS:	Meta Platforms, Inc. (NASDAQGS:META)	246.85	8:00:00 PM...	0.00	0.00%	22,857,590	25,844,188	247.09	241.19	247.09	88.0
NasdaqGS:	Alphabet Inc. (NASDAQGS:GOOGL)	122.83	8:00:00 PM...	0.00	0.00%	34,593,500	35,288,227	123.31	120.83	123.31	83.3
LSE:GSK	GSK plc (LSE:GSK)	17.67	8:00:00 PM...	0.00	0.00%	22,506,700	8,298,648	19.04	18.79	42.31	15.9
LSE:HSBA	HSBC Holdings plc (LSE:HSBA)	7.61	8:00:00 PM...	0.00	0.00%	16,947,140	37,650,807	8.12	7.86	8.12	5.4
NYSE:JNJ	Johnson & Johnson (NYSE:JNJ)	158.48	8:00:00 PM...	0.00	0.00%	5,172,052	7,560,399	180.93	179.39	183.35	150.1
NYSE:JPM	JPMorgan Chase & Co. (NYSE:JPM)	139.50	8:00:00 PM...	0.00	0.00%	10,992,610	14,639,612	144.34	142.66	144.34	101.2

### 2. 債券投資組合部位監控-財報數據(List Monitoring-key status)

**Market Monitor** Markets **List Monitoring** Portfolio List Performance +

TICKER	↑ ENTITY NAME	LAST PRICE	NET CHG (\$)	CHG (%)	TOTAL REVENUE	TOTAL REVENUE...	GROSS PROFIT	GROSS PROFIT	EBITDA (LAST	EBITDA MARGIN	EBIT (LAST TWELVE	EBIT MARGIN	EARNINGS FROM
LSE:TCS	TCS Group Holding	14.03	0.00	0.00%	2,341,744	6.39	2,341,744	NA	NA	NA	NA	NA	308,451
NasdaqGS:	Apple Inc. (NASDAQ)	175.05	0.00	0.00%	385,095,000	0.24	166,288,000	43.18	123,788,000	32.15	112,304,000	29.16	94,321,000
NasdaqGS:	Amazon.com, Inc. (A	118.15	0.00	0.00%	524,897,000	9.87	234,774,000	44.73	57,194,000	10.90	13,343,000	2.54	4,294,000
NasdaqGS:	Alphabet Inc. (NAS	122.83	0.00	0.00%	284,612,000	5.28	157,396,000	55.30	87,496,000	30.74	72,163,000	25.36	58,587,000
NasdaqGS:	Meta Platforms, Inc	246.85	0.00	0.00%	117,346,000	-1.94	93,379,000	79.58	42,456,000	36.18	33,402,000	28.47	21,444,000
NasdaqGS:	Microsoft Corporati	318.52	0.00	0.00%	207,591,000	7.81	142,246,000	68.52	100,080,000	48.21	85,974,000	41.42	69,020,000
NasdaqGS:	NVIDIA Corporation	316.78	0.00	0.00%	26,974,000	0.22	15,356,000	56.93	7,121,000	26.40	5,577,000	20.68	4,368,000
NYSE:C	Citigroup Inc. (NYSE	46.39	0.00	0.00%	71,359,000	1.93	71,359,000	NA	NA	NA	NA	NA	15,492,000
NYSE:JNJ	Johnson & Johnson	158.48	0.00	0.00%	96,263,000	1.46	64,477,000	66.98	33,101,000	34.39	26,020,000	27.03	12,724,000
NYSE:JPM	JPMorgan Chase &	139.50	0.00	0.00%	129,126,000	4.36	129,126,000	NA	NA	NA	NA	NA	42,016,000
NYSE:MA	Mastercard Incorp	392.02	0.00	0.00%	22,818,000	14.69	22,818,000	100.00	13,736,000	60.20	12,987,000	56.92	9,660,000
NYSE:PG	The Procter & Gam	152.53	0.00	0.00%	80,968,000	1.70	38,201,000	47.18	21,239,000	26.23	18,509,000	22.86	14,404,000
NYSE:SPGI	S&P Global Inc. (NY	363.80	0.00	0.00%	11,952,000	37.86	7,847,000	65.65	5,598,000	46.84	4,435,000	37.11	3,083,000
NYSE:V	Visa Inc. (NYSE:V)	233.60	0.00	0.00%	30,983,000	15.02	30,263,000	97.66	21,658,000	69.90	20,741,000	66.94	15,787,000
NYSE:WMT	Walmart Inc. (NYSE	151.47	0.00	0.00%	622,021,000	7.99	149,863,000	24.09	36,560,000	5.88	25,450,000	4.09	11,085,000
SEHK:2318	Ping An Insurance (	7.19	0.00	0.00%	186,955,138	13.78	51,660,286	27.63	23,411,928	12.52	21,526,056	11.51	17,701,228
SEHK:700	Tencent Holdings Li	43.41	0.00	0.00%	82,540,510	0.99	35,556,368	43.08	16,980,317	20.57	13,494,889	16.35	28,087,788
TSE:7203	Toyota Motor Corpo	14.16	0.00	0.00%	274,864,929	18.40	46,703,256	16.99	35,250,622	12.53	20,159,554	7.32	18,442,808
TSE:8306	Mitsubishi UFJ Fina	6.78	0.00	0.00%	49,430,555	126.25	49,430,555	NA	NA	NA	NA	NA	8,879,858
TWSE:2330	Taiwan Semiconduc	17.21	0.00	0.00%	75,080,356	32.95	44,810,703	59.68	51,241,408	68.25	37,171,350	49.51	33,605,258



### 3. 債券投資組合部位監控-資本狀況(List Monitoring-Multiples & Capitalization)

Market Monitor													
Stock Performance X Key Stats X Multiples & Capitalization X Estimates X Credit Ratings X +													
TICKER	↑ ENTITY NAME	LAST PRICE	NET CHG (\$)	CHG (%)	SHARES OUTSTANDING	MARKET CAPITALIZATIO...	TOTAL ENTERPRISE VALUE (CIQ)	TEV/ EBITDA	PRICE/ EPS (CIQ)	PRICE/BOOK (CIQ)	TEV/ FORWARD	TEV/ FORWARD	FOR
LSE:TCS	TCS Group Holdin	14.03	0.00	0.00%	198,702,517	2,788,730.22	NA	NA	9.97	0.99	NA	NA	
NasdaqGS: Apple Inc. (NASD		175.05	0.00	0.00%	15,728,702,000	2,753,309,285.10	2,696,591,285.1	19.18	29.76	44.28	6.76	21.04	
NasdaqGS: Amazon.com, Inc.		118.15	0.00	0.00%	10,260,353,688	1,212,260,788.24	1,326,402,788.2	19.41	280.64	7.84	2.31	14.37	
NasdaqGS: Alphabet Inc. (NA		122.83	0.00	0.00%	12,697,000,000	1,563,625,570.00	1,478,016,570.0	16.41	27.31	5.99	4.84	12.32	
NasdaqGS: Meta Platforms, I		246.85	0.00	0.00%	2,562,732,034	632,610,402.59	623,433,402.6	13.90	30.66	5.08	4.81	9.39	
NasdaqGS: Microsoft Corpora		318.52	0.00	0.00%	7,435,487,575	2,368,351,502.39	2,343,244,502.4	22.78	34.51	12.17	10.29	20.68	
NasdaqGS: NVIDIA Corporatic		316.78	0.00	0.00%	2,473,129,295	783,437,898.07	782,172,898.1	106.94	182.06	35.35	26.03	75.78	
NYSE:C Citigroup Inc. (NYSE		46.39	0.00	0.00%	1,946,751,837	90,309,817.72	NA	NA	6.47	0.48	NA	NA	
NYSE:JNJ Johnson & Johnso		158.48	0.00	0.00%	2,797,468,519	443,342,810.89	471,636,810.9	14.12	33.04	5.81	4.75	13.12	
NYSE:JPM JPMorgan Chase		139.50	0.00	0.00%	2,922,288,509	407,659,247.01	NA	NA	10.29	1.48	NA	NA	
NYSE:MA Mastercard Inco		392.02	0.00	0.00%	947,628,852	371,489,462.56	379,830,462.6	27.65	39.17	69.73	14.61	23.84	
NYSE:PG The Procter & Gar		152.53	0.00	0.00%	2,356,969,322	359,508,530.68	389,606,530.7	18.08	26.58	8.11	4.63	17.49	
NYSE:SPGI S&P Global Inc. (N		363.80	0.00	0.00%	320,790,171	116,703,464.21	131,147,464.2	22.70	42.73	3.22	10.47	21.97	
NYSE:V Visa Inc. (NYSE:V)		233.60	0.00	0.00%	2,049,144,694	478,680,200.52	484,577,200.5	22.25	31.22	13.06	14.16	20.02	
NYSE:WMT Walmart Inc. (NYSE		151.47	0.00	0.00%	2,697,346,823	408,567,123.28	468,919,123.3	11.79	36.43	5.64	0.74	12.61	
SEHK:2318 Ping An Insurance		7.19	0.00	0.00%	18,107,641,995	132,023,044.35	404,806,347.3	16.68	9.08	0.98	3.61	NA	
SEHK:700 Tencent Holdings		43.41	0.00	0.00%	9,498,550,912	412,300,990.75	431,053,543.9	28.52	15.54	3.95	4.77	14.37	
TSE:7203 Toyota Motor Cor		14.16	0.00	0.00%	13,565,179,729	191,440,121.24	370,111,219.1	9.48	10.90	0.94	1.34	11.01	
TSE:8306 Mitsubishi UFJ Fir		6.78	0.00	0.00%	11,754,522,867	80,224,677.95	NA	NA	10.46	0.66	NA	NA	
TWSE:2330 Taiwan Semicond		17.21	0.00	0.00%	25,932,071,000	446,393,115.40	424,251,883.1	8.33	13.47	4.67	5.74	8.42	

### 4. 債券投資組合部位監控-市場估值(List Monitoring-Estimates)

Market Monitor													
Stock Performance X Key Stats X Multiples & Capitalization X Estimates X Credit Ratings X +													
TICKER	↑ ENTITY NAME	LAST PRICE	NET CHG (\$)	CHG (%)	CIQ TARGET PRICE (\$)	CIQ TARGET PRICE EST DATE (MM/DD/YYYY)	CIQ AVG BROKER REC (TEXT)	CIQ NUMBER OF TOT REC (ACTUAL)	COUNTRY... CODE	SECTOR	INDUSTRY GROUP		
ASX:BHP	BHP Group Limited	29.28	0.00	0.00%	30.89	05/17/2023	Outperform	18	AU	Materials	Materials		
KOSE:A005 Samsung Electroni		50.94	0.00	0.00%	59.96	05/01/2023	Buy	39	KR	Informatio...	Technology...		
LSE:AZN	AstraZeneca PLC (L	148.68	0.00	0.00%	166.84	05/18/2023	Buy	24	GB	Health Care	Pharmace...		
LSE:BATS	British American To	32.97	0.00	0.00%	47.28	05/17/2023	Outperform	16	GB	Consumer ...	Food, Beve...		
LSE:BP	BP p.l.c. (LSE:BP)	5.97	0.00	0.00%	7.70	05/17/2023	Outperform	22	GB	Energy	Energy		
LSE:DGE	Diageo plc (LSE:DI	43.88	0.00	0.00%	49.36	05/18/2023	Outperform	23	GB	Consumer ...	Food, Beve...		
LSE:GSK	GSK plc (LSE:GSK)	17.67	0.00	0.00%	21.44	05/15/2023	Outperform	23	GB	Health Care	Pharmace...		
LSE:HSBA	HSBC Holdings plc	7.61	0.00	0.00%	9.24	05/18/2023	Outperform	21	GB	Financials	Banks		
LSE:SHEL	Shell plc (LSE:SHEL	29.70	0.00	0.00%	36.00	05/17/2023	Outperform	20	GB	Energy	Energy		
LSE:TCS	TCS Group Holding	14.03	0.00	0.00%	NA			NA	CY	Financials	Banks		
NasdaqGS: Apple Inc. (NASDAO		175.05	0.00	0.00%	179.07	05/18/2023	Outperform	44	US	informatio...	Technology...		
NasdaqGS: Amazon.com, Inc. (f		118.15	0.00	0.00%	137.24	05/18/2023	Outperform	49	US	Consumer ...	Consumer ...		
NasdaqGS: Alphabet Inc. (NAS		122.83	0.00	0.00%	130.67	05/17/2023	Buy	50	US	Communic...	Media and ...		
NasdaqGS: Meta Platforms, Inc		246.85	0.00	0.00%	267.61	05/17/2023	Outperform	56	US	Communic...	Media and ...		
NasdaqGS: Microsoft Corporati		318.52	0.00	0.00%	332.23	05/17/2023	Outperform	51	US	Informatio...	Software a...		
NasdaqGS: NVIDIA Corporation		316.78	0.00	0.00%	288.85	05/18/2023	Outperform	48	US	Informatio...	Semicondu...		
NYSE:C Citigroup Inc. (NYSE		46.39	0.00	0.00%	56.06	05/18/2023	Outperform	24	US	Financials	Banks		
NYSE:JNJ Johnson & Johnson		158.48	0.00	0.00%	178.89	05/15/2023	Outperform	20	US	Health Care	Pharmace...		
NYSE:JPM JPMorgan Chase &		139.50	0.00	0.00%	159.72	05/17/2023	Outperform	26	US	Financials	Banks		
NYSE:MA Mastercard Inco		392.02	0.00	0.00%	432.97	05/15/2023	Outperform	37	US	Financials	Financial S...		

### 5. 債券投資組合部位監控-信評資料(List Monitoring- Credit Ratings)

Type to add entities



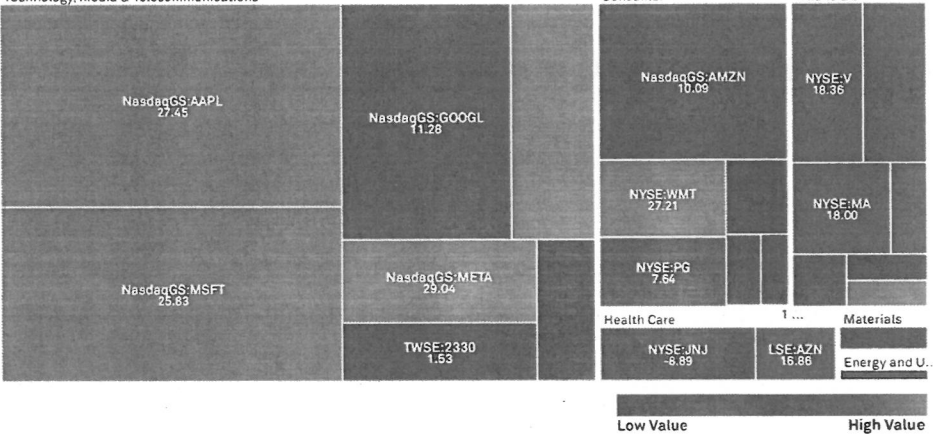
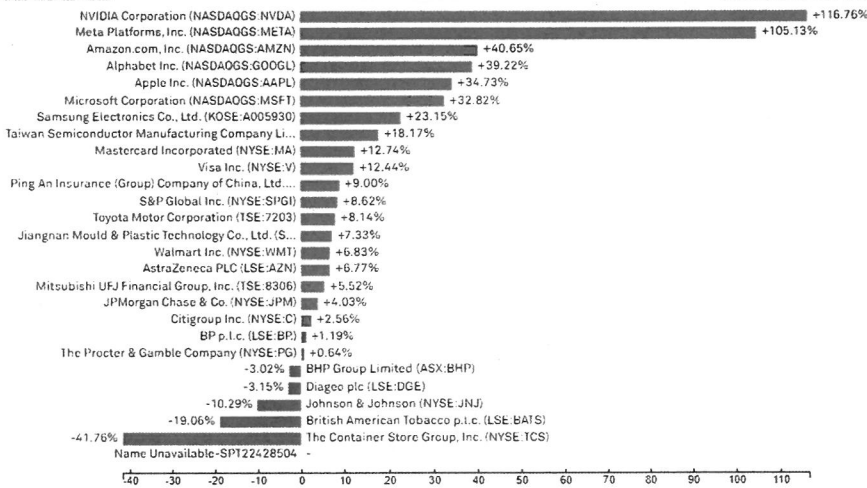
List No list selected

Group by

None

TICKER	↑ ENTITY NAME	S&P CREDIT...	S&P LAST REVIEW DATE (ISSUER CREDIT...	COUNTRY/REGION CODE	COUNTRY / REGION NAME
ASX:BHP	BHP Group Limited (ASX:BHP)	A-	10/27/2022	AU	Australia
KOSE:A005	Samsung Electronics Co., Ltd. (KOSE:A005930)	AA-	07/26/2022	KR	South Korea
LSE:AZN	AstraZeneca PLC (LSE:AZN)	A	12/05/2022	GB	United Kingdom
LSE:BATS	British American Tobacco p.l.c. (LSE:BATS)	BBB+	04/19/2023	GB	United Kingdom
LSE:BP	BP p.l.c. (LSE:BP)	A-	02/09/2023	GB	United Kingdom
LSE:DGE	Diageo plc (LSE:DGE)	A-	05/24/2023	GB	United Kingdom
LSE:GSK	GSK plc (LSE:GSK)	A	05/23/2023	GB	United Kingdom
LSE:HSBA	HSBC Holdings plc (LSE:HSBA)	A-	05/23/2023	GB	United Kingdom
LSE:SHEL	Shell plc (LSE:SHEL)	A+	07/28/2022	GB	United Kingdom
LSE:TCS	TCS Group Holding PLC (LSE:TCS)			CY	Cyprus
NasdaqGS: Apple Inc. (NASDAQGS:AAPL)		AA+	05/19/2023	US	USA
NasdaqGS: Amazon.com, Inc. (NASDAQGS:AMZN)		AA	05/18/2023	US	USA
NasdaqGS: Alphabet Inc. (NASDAQGS:GOOGL)		AA+	02/22/2023	US	USA
NasdaqGS: Meta Platforms, Inc. (NASDAQGS:META)		AA-	02/22/2023	US	USA
NasdaqGS: Microsoft Corporation (NASDAQGS:MSFT)		AAA	07/18/2022	US	USA
NasdaqGS: NVIDIA Corporation (NASDAQGS:NVDA)		A	04/19/2023	US	USA
NYSE:C	Citigroup Inc. (NYSE:C)	BBB+	06/17/2022	US	USA

### 6. 債券投資組合部位監控-績效圖(List Performance)



Low Value High Value

(二)個別公司監控-以台積電為例

1.信評狀況

# Taiwan Semiconductor Manufacturing Company Limited - 台灣積體電路製造股份有限公司 | PUBLIC COMPANY

TWSE:2330 (MI KEY: 4589256; SPCIQ KEY: 380075)

Currency **U.S. Dollar (USD)** Financials Source **S&P Capital IQ** Debt Type **Issuer C**

Issuer Credit Rating (Foreign Currency LT) Source: S&P Global Ratings

**AA-** 9/26/2018  
**Outlook Stable** 9/26/2018  
Last Review ⓘ 9/26/2022

Prior Rating  
**A+** 4/20/2010  
Outlook Positive 9/21/2017

Latest Research:  
Full Analysis  
10/20/2022

Ratings & History ▶  
Securities Summary ▶

Latest News

Applied Material  
Slips. -- Barrons.  
5 hours ago

## Rating Snapshot Source: S&P Global Ratings

Outlook Scores & Modifiers ESG Credit Indicators Criteria

Full Analysis 10/20/2022 4:21 AM

The stable rating outlook reflects our view that TSMC's dominant market position, strengthened leadership in process technologies, and more diversified end-market applications will help the company sustain strong profitability and cash flow over the next two years. Despite likely semiconductor headwinds over the next one to two years, we expect TSMC's...VIEW ALL

### ⌵ DOWNSIDE SCENARIO

We could lower the rating on TSMC if:

⌵ The company fails to maintain its leading technology position and loses market share, resulting in significant deterioration in its profitability and cash flow, or

⌵ TSMC changes its prudent financial policy through more aggressive shareholder distributions or mergers and acquisitions and takes on high leverage. A ratio of debt to EBITDA exceeding 1.0x for an extended period, increased cash flow volatility due to mergers and acquisitions, or a weakening competitive position could indicate such a change.

### ⌵ UPSIDE SCENARIO

Higher volatility and competition in the global semiconductor foundry industry and still-significant customer concentration constrain the potential for an upgrade over the next two years.

# Rating Snapshot Source: S&P Global Ratings

Outlook Scores & Modifiers ESG Credit Indicators Criteria

Anchor: **aa-** → Stand Alone Credit Profile: **aa-**

## SCORES

Business Risk	Strong	
Industry Risk	Moderately High Risk	
Country Risk	Intermediate Risk	
CICRA	Moderately High Risk	
Competitive Position	Excellent	
Financial Risk	Minimal	
Anchor	<b>aa-</b>	

## MODIFIERS

Diversification / Portfolio Effect	Neutral (no impact)	
Capital Structure	Neutral (no impact)	
Financial Policy	Neutral (no impact)	
Liquidity	Strong (no impact)	
Management & Governance	Strong (no impact)	
Comparable Rating Analysis	Neutral (no impact)	
Stand Alone Credit Profile	<b>aa-</b>	

## 2. 信評歷史

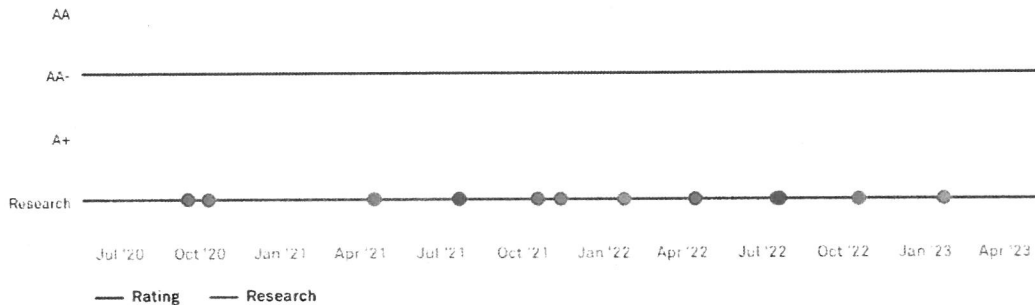
### Credit Story

Ratings & Research Market Derived Signals

Source: S&P Global Ratings

Issuer Credit Rating | Foreign Currency LT

Period 3 Years



Article Type All

HEADLINE	TYPE	DATE	AUTHOR	DOWNLOAD
Industry Top Trends 2023: Technology	● Commentary	1/23/2023	Andrew Chang	<a href="#">PDF</a>
Taiwan Semiconductor Manufacturing Co. Ltd.	● Full Analysis	10/20/2022	Clifford Waits Kurz, CFA	<a href="#">PDF</a>
Bulletin: TSMC Could Sustain Strong Profitability Amid Downstream Inventory Correction	● Bulletin	7/22/2022	Clifford Waits Kurz, CFA	<a href="#">PDF</a>
TSMC Global's Notes Issuance Rated 'AA-'	● Rating Action News	7/18/2022	Clifford Waits Kurz, CFA	<a href="#">PDF</a>
TSMC Arizona Corp.'s Notes Drawdown Rated 'AA-'	● Rating Action News	4/18/2022	Clifford Waits Kurz, CFA	<a href="#">PDF</a>

More ▶

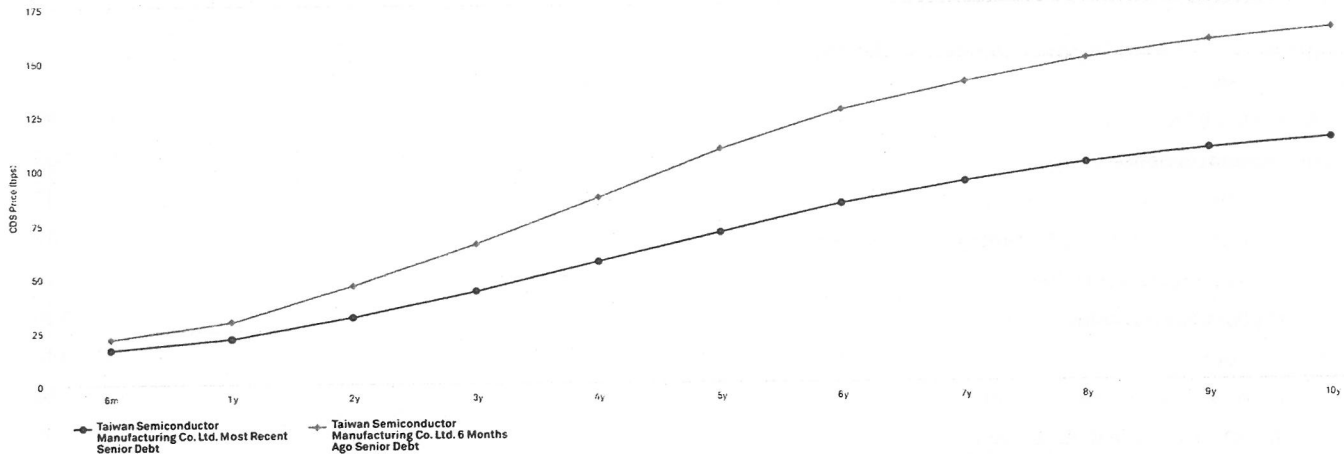
### 3. CDS 及違約機率變化

#### Credit Story

Ratings & Research	Market Derived Signals						
MARKET DERIVED SIGNAL	SIGNAL	SIGNAL DATE	Z-SCORE	SPREAD (BPS)	CHANGE (BPS)	CHANGE (%)	METHODOLOGY
Credit Default Swap Based	a-	5/17/2023	1.50	74.20	(17.90)	(19.50)	<a href="#">PDF</a>
Probability of Default Based	aa-	2/24/2015	(0.30)				<a href="#">PDF</a>

\*CDS Data Provided by CMA --\* Previous day's close

Taiwan Semiconductor Manufacturing Co. Ltd. - CDS Curve  
CDS price is derived by S&P Capital IQ (no observed price for the past 5 days)



### 4. 財務狀況

#### Financials

Financial Highlights [CreditStats Direct](#)

Source: S&P Global Ratings

CURRENCY: TWD* TEMPLATE: ADJUSTED	2020 FY	2021 FY	2022 FY
Period End Date	12/30/2020	12/30/2021	12/30/2022
Currency Code*	TWD	TWD	TWD
Adjustment Status	Reviewed	Reviewed	Reviewed
<b>Core Ratios</b>			
Debt/ EBITDA, Adjusted (x)	0.00	0.00	0.00
<b>Key Figures</b>			
Revenue, Adjusted (NT\$M)	1,339,254.81	1,587,415.04	2,263,891.29
EBITDA, Adjusted (NT\$M)	901,267.04	1,074,519.98	1,561,585.14
Operating Income (After D&A), Adjusted (NT\$M)	569,542.35	652,125.11	1,124,330.87
EBIT, Adjusted (NT\$M)	586,858.64	668,540.53	1,155,940.70
FFO, Adjusted (NT\$M)	848,123.58	987,188.50	1,462,805.23
Cash Flow from Ops, Adjusted (Pensions Normalized) (NT\$M)	829,118.61	1,112,010.21	1,614,969.98
Free Operating Cash Flow, Adjusted (NT\$M)	321,879.88	272,814.51	532,297.85
Discretionary Cash Flow, Adjusted (NT\$M)	62,576.08	7,028.11	246,192.10
Debt, Adjusted (NT\$M)	0.00	0.00	0.00
<b>Supplemental Ratios - Interest Coverage</b>			
EBITDA Interest Coverage, Adjusted (x)	433.00	198.46	132.90
FFO Cash Interest Coverage, Adjusted (x)	477.18	258.51	120.72
<b>Profitability Metrics</b>			
EBITDA Margin, Adjusted (%)	67.30	67.69	68.98
Return on Capital, Adjusted (%)	33.80	33.25	45.06
EBIT Margin (%)	43.82	42.12	51.06

\*Reported Currency

[More](#)

## 5. 同業比較

### S&P Global Ratings Analyst Peers

#### Issuer Credit Rating | Foreign Currency LT

COMPANY NAME	RATING	RATING DATE	CREDITWATCH /OUTLOOK	CREDITWATCH /OUTLOOK DATE
Taiwan Semiconductor Manufacturing Company Limited	AA-	9/25/2018	Stable	9/25/2018
Intel Corporation	A	2/1/2023	Negative	2/1/2023
Texas Instruments Incorporated	A+	9/23/2010	Stable	9/23/2010
Samsung Electronics Co., Ltd.	AA-	7/20/2017	Stable	7/20/2017

[More ▶](#)

## 6. 以信用風險為基礎之 ESG 評分

### Environmental, Social & Governance

#### ESG Analytics Climate & Environmental Analytics

S&P Global ESG Score	<b>84 / 100</b>
<b>^ Environmental Score</b> Climate Strategy Environmental Policy & Management Systems Operational Eco-Efficiency Product Stewardship	<b>88 / 100</b> 87 89 94 100
<b>^ Social Score</b> Human Capital Development Talent Attraction & Retention	<b>73 / 100</b> 65 65
<b>^ Governance &amp; Economic Score</b> Innovation Management Product Quality & Recall Management Supply Chain Management	<b>87 / 100</b> 82 100 100
Methodology Year	2022

[More ▶](#)

### ESG CREDIT INDICATORS AND FACTORS ⓘ

#### Environmental

Neutral Influence

E-2

*Not Applicable*

#### Social

Neutral Influence

S-2

*Not Applicable*

#### Governance

Positive Influence

G-1

- Risk management, culture and oversight

ESG Credit Indicators Coverage ▶

## 7. 風險測量綜合分數

### RiskGauge Score <sup>1</sup> Powered By Credit Analytics



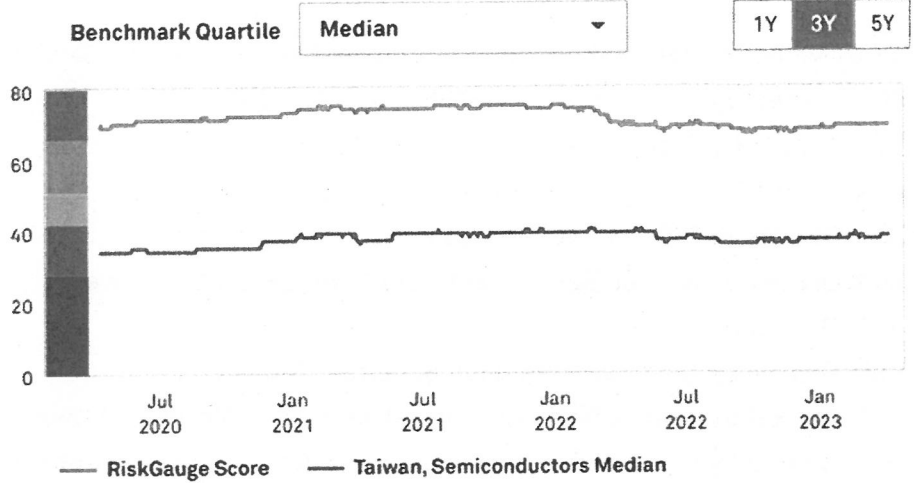
8 Complimentary Scores Remaining

**69**  
Low Risk  
(1-100 scale)

a-

Previous  
69

Change  
-



[Sample RiskGauge Report](#) | [White Paper](#)

Historical Equity Pricing Data supplied by Interactive Data Pricing and Reference Data LLC



## 8. 公司結構-可進行投資前及定期 KYC 分析

### CORPORATE STRUCTURE OF TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY LIMITED

Search...

Taiwan Semiconductor Manufacturing Company Limited - Taiwan | Semiconductors [VIEW TOP INVESTORS](#)

- Japan Advanced Semiconductor Manufacturing, Inc. - Japan | Majority (Subsidiary) | Semiconductors
- QUALCOMM Panel Manufacturing Ltd. - Taiwan | Majority (Subsidiary) - 100.00% owned | Unclassified
- TSMC (Nanjing) Co. Ltd. - China | Majority (Subsidiary) | Semiconductors
- TSMC Arizona Corporation - AZ, USA | Majority (Subsidiary) | Semiconductors
- TSMC China Company Limited - China | Majority (Subsidiary) - 100.00% owned | Electronic Manufacturing Services
- TSMC Design Technology Japan, Inc. - Japan | Majority (Subsidiary) | Semiconductors
- TSMC Global Ltd. - BVI | Majority (Subsidiary) - 100.00% owned | Specialty Finance: Commercial Focused
- TSMC Guang Neng Investment, Ltd. - Taiwan | Majority (Subsidiary) - 100.00% owned | Unclassified
- TSMC International Investment Ltd. - BVI | Majority (Subsidiary) | Asset Management
- TSMC North America, Inc. - CA, USA | Majority (Subsidiary) | Technology Distributors
- TSMC Partners - BVI | Majority (Subsidiary) - 100.00% owned | Asset Management
- TSMC Solar Europe B.V. - Netherlands | Majority (Subsidiary) | Electric Utilities
- Taiwan Semiconductor Manufacturing Co. Ltd, ESOP - Taiwan | Majority (Investment) | Asset Management
- Tsmc Design Technology Canada Inc. - Canada | Majority (Subsidiary) | Unclassified
- Tsmc Europe B.v. - Netherlands | Majority (Subsidiary) | Trading Companies and Distributors
- Tsmc Japan Limited - Japan | Majority (Subsidiary) | Unclassified
- Tsmc Korea Limited - South Korea | Majority (Subsidiary) | Unclassified
- Tsmc Solar North America, Inc - USA | Majority (Subsidiary) | Unclassified
- Tsmc Technology, Inc. - USA | Majority (Subsidiary) | Unclassified
- VentureTech Alliance LLC - CA, USA | Majority (Subsidiary) | Asset Management
- Mutual-Pak Technology Co. Ltd. - Taiwan | Majority (Investment) - 59.00% owned | Communications Equipment
- VisEra Holding Company - Cayman Islands | Majority (Subsidiary) - 85.50% owned | Unclassified
- VisEra Technologies Company Ltd. - Taiwan | Majority (Subsidiary) - 73.40% owned | Semiconductors
- WaferTech, LLC - WA, USA | Majority (Subsidiary) - 100.00% owned | Semiconductor Materials and Equipment

# Top Institutional Investor and Stakeholder Summary of Taiwan Semiconductor Manufacturing Company Limited

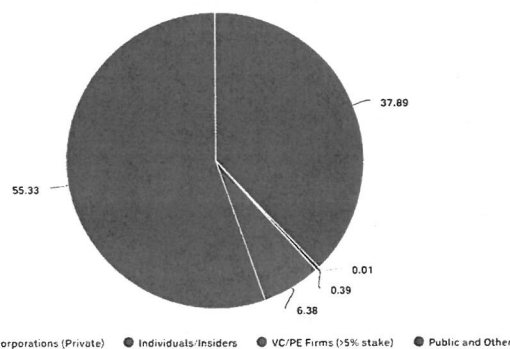
- 6.38% Owned by National Development Fund, Executive Yuan - Taiwan
- 4.88% Owned by BlackRock Inc. (NYSE:BLK) - NY, USA
- 3.58% Owned by Capital Research & Mgmt Co. - CA, USA
- 3.41% Owned by Vanguard Group Inc. - PA, USA
- 2.50% Owned by GIC Pte. Ltd. - Singapore
- 1.40% Owned by Norges Bank Investment Management - Norway
- 1.34% Owned by FMR LLC - MA, USA
- 1.08% Owned by New Labor Pension Scheme - Taiwan
- 1.04% Owned by Yuanta Securities Investment Trust Co. Ltd. - Taiwan
- 0.90% Owned by Fubon Life Insurance Co. Ltd. Asset Management Arm - Taiwan

[View Details ▶](#)

## Ownership Summary

TYPE	COMMON STOCK EQUIVALENT HELD	PERCENT OF COMMON SHARES OUTSTANDING (%)	MARKET VALUE (\$M)
Institutions	9,826,857,627	37.89	180,872.2
Corporations (Private)	1,676,094	0.01	30.9
Individuals/Insiders	102,328,982	0.39	1,883.5
VC/PE Firms (>5% stake)	1,653,709,980	6.38	30,438.0
Public and Other	14,347,498,309	55.33	264,078.7
<b>Total</b>	<b>25,932,070,992</b>	<b>100.00</b>	<b>477,303.2</b>

Summary: Percent of Common Shares Outstanding (%)



## Float Summary

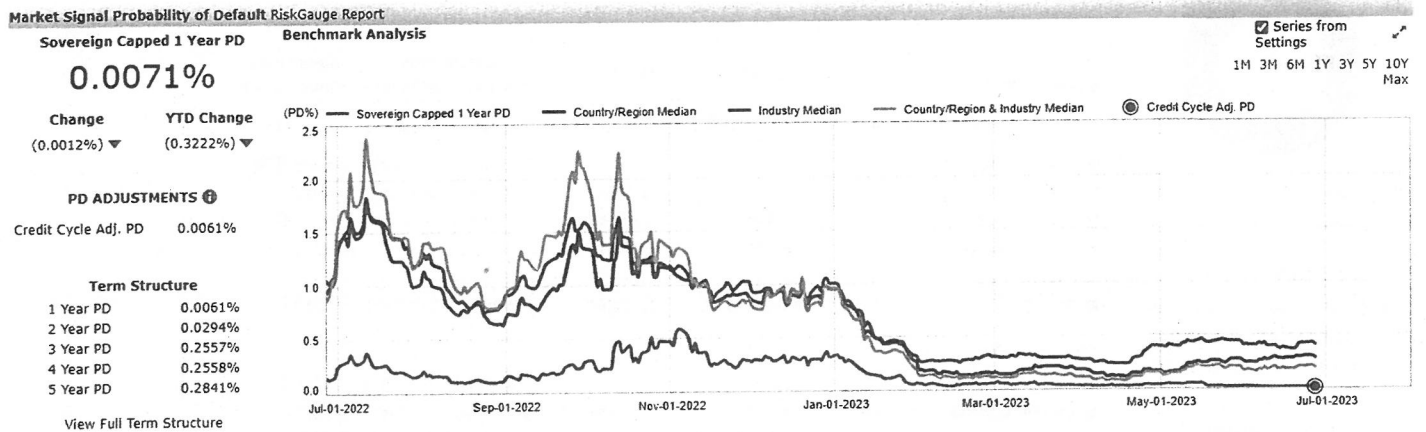
Taiwan Semiconductor Manufactu	
Standardized Data	
May-26-2023	
Company Employees/ Individual Insiders	102,328,982
+ Strategic Corporate Investors	1,676,094
+ VC/PE Firms (>5% stake)	1,653,709,980
= Total Shares Excluded From Float	1,757,715,056
Free Float Shares	24,174,355,936
/ Shares outstanding	25,932,070,992
= Float%	93



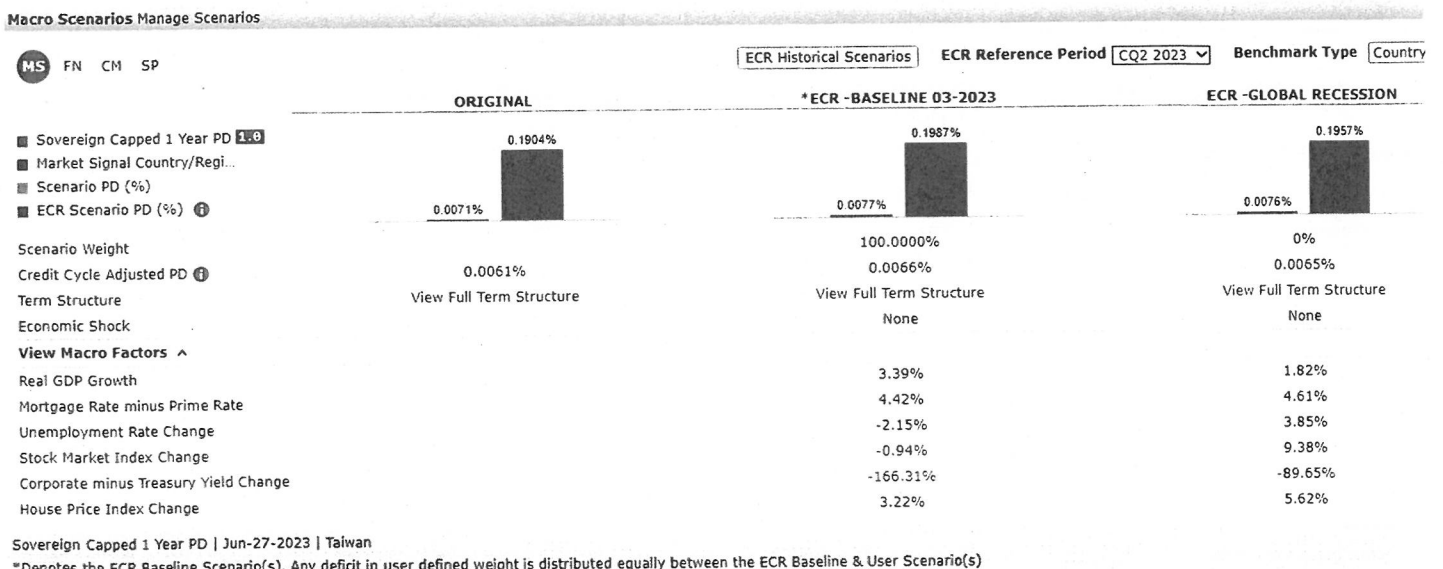
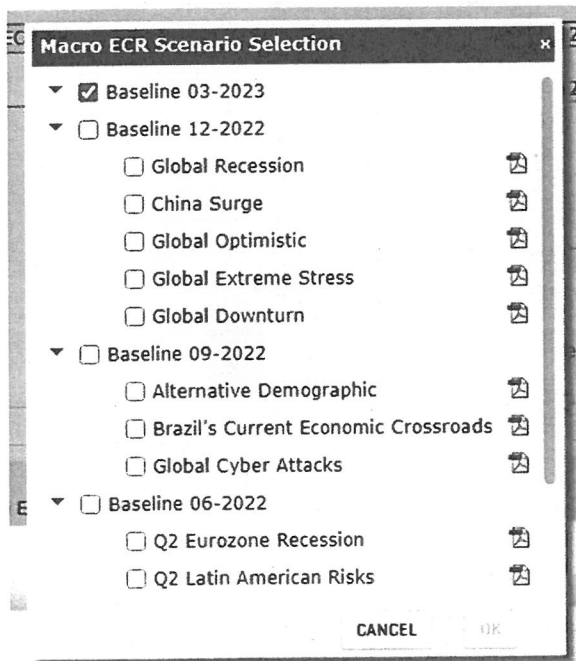


(三)利用信用分析模型，進行部位監控

模型1(Market Signal Probability of Default)：利用市場即時訊號(ex.股價)-即時監控公司違約率的變化，可與同一產業或同一區域公司進行比較。



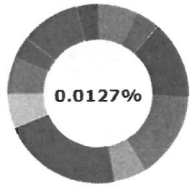
壓力測試：透過調整情境，看公司違約率之變化(選擇 Baseline 12-2022：Global Recession)



## 模型 2(Fundamental Probability of Default)：利用公司實際財報數據進行違約率計算

Fundamental Probability of Default Apply Qualitative Adj. | Score Company | RiskGauge Report

### Contribution Analysis



Prior Score 0.0128%  
Change ▼

#### PD ADJUSTMENTS

Credit Cycle Adj. PD 0.0109%  
Market Signal Adj. PD 0.0050%  
Final Adjusted PD 0.0043%

#### Term Structure

1 Year PD 0.0043%  
2 Year PD 0.0219%  
3 Year PD 0.2557%  
4 Year PD 0.2557%  
5 Year PD 0.2839%

Business Risk	Ratio Value	Median	Contribution		Sensitivity Value Rank
			Relative	Absolute	
■ Corporate Industry Risk Score	moderately high risk	moderately high risk	0.0000%	7.2965%	0.1181
■ Country/Region Risk Score	a	a	0.0000%	3.7419%	0.1608
■ CPI Growth	2.71%	1.83%	2.1410%	0.5754%	0.0015
■ EBIT / Revenues	49.47%	10.64%	(45.5007%)	13.9145%	0.0510
■ PPE / Total Assets	56.98%	20.81%	17.6728%	15.9367%	0.0222
■ Sales Growth	32.94%	(1.47%)	(14.1602%)	5.7408%	0.0065
■ Total Equity	3,092,897.5*	2,352.6*	(95.5081%)	21.4949%	0.0162
<b>Financial Risk</b>					
■ Cash / Total Assets	32.00%	28.95%	(2.6396%)	6.3531%	0.0248
■ Current Liabilities / Net Wor...	28.22%	31.41%	(1.1270%)	6.6486%	0.0089
■ Debt / (Debt + Equity)	22.45%	11.82%	0.0000%	0.0000%	0.0000
■ EBIT Interest Coverage	89.77x	40.43x	(2.0495%)	3.8853%	0.0037
■ FFO Interest Coverage	0.00x	0.00x	0.0000%	0.0000%	0.0000
■ Retained Earnings / Total As...	54.96%	17.50%	(29.9773%)	10.5877%	0.0396
■ Return on Net Capital	41.63%	10.38%	(13.0483%)	3.8240%	0.0059

## 壓力測試：可自行調整情境或財報數據進行測試

### a. 調整情境( Baseline 12-2022 : Global Recession)

Macro Scenarios Manage Scenarios | Score Company

MS FN CM SP

ECR Historical Scenarios

ECR Reference Period

CQ2 2023

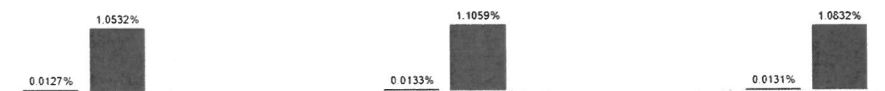
Benchmark Type Country/

ORIGINAL

\* ECR -BASELINE 03-2023

ECR -GLOBAL RECESSION

- Sovereign Capped 1 Year PD 1.0%
- Fundamental PD Country/R...
- Scenario PD (%)
- ECR Scenario PD (%)



Scenario Weight	ORIGINAL	* ECR -BASELINE 03-2023	ECR -GLOBAL RECESSION
Credit Cycle Adjusted PD	0.0109%	100.0000%	0%
Market Signal Adjusted PD	0.0050%	0.0114%	0.0112%
Final Adjusted PD	0.0043%	0.0053%	0.0052%
Term Structure	View Full Term Structure	View Full Term Structure	View Full Term Structure
Economic Shock	None	None	None
<b>View Macro Factors</b>			
Real GDP Growth	3.39%	3.39%	1.82%
Mortgage Rate minus Prime Rate	4.42%	4.42%	4.61%
Unemployment Rate Change	-2.15%	-2.15%	3.85%
Stock Market Index Change	-0.94%	-0.94%	9.38%
Corporate minus Treasury Yield Change	-166.31%	-166.31%	-89.65%
House Price Index Change	3.22%	3.22%	5.62%

Sovereign Capped 1 Year PD | FQ12023 (Mar-31-2023) | Taiwan

\*Denotes the ECR Baseline Scenario(s). Any deficit in user defined weight is distributed equally between the ECR Baseline & User Scenario(s)

### b. 調整財報數據 - 調整市場最新預估數據(ex. 損益表上之營收)重新計算違約率

FINANCIAL INPUTS MILLIONS, TWD

	VALUE	INPUT
<b>Income Statement</b>		
Earnings from Cont. Ops	1,020,976.1	1020976.1
EBIT	1,128,726.8	1128726.8
Income Tax Expense	140,657.7	140657.7
(Interest Expense)	(12,572.9)	(12572.9)
Operating Income	1,128,726.8	1128726.8
Total Revenue	2,281,448.3	2281448.3
Total Revenue - Prior Year	1,716,080.6	1716080.6
<b>Cash Flow</b>		
Depreciation & Amort., Total	431,650.8	431650.8
Other Non-Cash Items, Total	33,209.2	33209.2

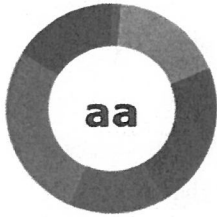
模型 3(CreditModel Score)：利用 S&P 設計之信用模型，對公司進行評分

a. 內容包括各因子對該評分的貢獻度及敏感性。

b. 該模型經 S&P 驗證：其評分結果 70%以上與信評評等結果差距不到一的等級，故該模型適合無信評無擔保之公司使用

CreditModel Score Score Company | RiskGauge Report

Contribution Analysis



Prior Score	Change	Financial Input Ratios	Ratio Value		Contribution		Sensitivity	
			Value	Median	Relative	Absolute	Value	Rank
aa	-	■ Acid Test Ratio	2.03x	2.00x	(0.0099%)	1.5962%	0.0009	
		■ Asset Turnover	0.45x	0.70x	0.6251%	17.1777%	0.0058	
		■ Debt / (Debt + Equity)	22.45%	14.15%	0.0800%	23.2575%	0.0193	
		■ EBIT Interest Coverage	89.77x	53.93x	0.0000%	0.0000%	0.0000	
		■ FFO Interest Coverage	118.54x	88.26x	0.0000%	0.0000%	0.0000	
		■ Free Operating Cash Flow / ...	55.90%	51.40%	(0.0440%)	14.7131%	0.0070	
		■ Gearing Ratio	28.60%	5.14%	0.3225%	27.3412%	0.0101	
		■ Operating Income (bef. D&...	68.39%	19.00%	(0.1464%)	0.0000%	0.0000	
		■ Return on Capital	31.66%	12.46%	(2.7429%)	15.9141%	0.0269	
		■ Total Assets	5,045,844.3*	5,285.4*	(53.5138%)	0.0000%	0.0000	

PD ADJUSTMENTS ⓘ	
Credit Cycle Adj. PD	0.0074%
Market Signal Adj. PD	0.0034%
Final Adjusted PD	0.0029%

Observed Default Rates	
1 Year PD	0.0029%
2 Year PD	0.0160%
3 Year PD	0.2478%
4 Year PD	0.2478%
5 Year PD	0.2751%

View Full Term Structure

建立自有債券投資組合，進行上述三種模型各項變化之即時監控

Credit Analytics

Company Name	Market Signal Sovereign Capped 1 Year PD			YTD	Fundamental Sovereign Capped 1 Year PD	Change			YTD	Credit Model Sovereign Capped Score		Change	Credit Model Sovereign Capped Parental & Govt Support Score
	Change	YTD	Change			YTD	Change	YTD					
General Dynamics Corpor	0.1002%	-0.0015%	-0.0189%	☑	0.0290%	-0.0007%	-0.0007%	☑	bbb+	-	-	-	-
Lockheed Martin Corporat	0.0484%	-0.0003%	-0.0424%	☑	0.0570%	-0.0021%	-0.0021%	☑	bbb+	▼	-	-	-
Raytheon Technologies Ct	0.1294%	-0.0013%	-0.0645%	☑	0.0679%	-0.0059%	-0.0059%	☑	a-	-	-	-	-
The Boeing Company (NY	0.4403%	-0.0077%	-0.8655%	☑	13.9824%	-2.2799%	-2.2799%	☑	bb-	-	-	-	-
FedEx Corporation (NYSE	0.4040%	-0.0113%	-0.2278%	☑	0.0233%	-0.0023%	0.0003%	☑	bbb	-	-	-	-
United Parcel Service, Inc	0.0927%	-0.0029%	-0.0551%	☑	0.0417%	-0.0025%	-0.0025%	☑	bbb	▼	-	-	-
Adobe Inc. (NasdaqGS:AI	0.3226%	-0.0082%	-0.2449%	☑	0.0159%	-0.0006%	-0.0005%	☑	a+	▲	-	-	-
Salesforce, Inc. (NYSE:CF	0.3891%	-0.0074%	-0.6222%	☑	0.1339%	-0.0606%	-	☑	bbb+	▲	-	-	-
BlackRock, Inc. (NYSE:BL	0.0949%	-0.0028%	-0.1921%	☑	-	-	-	☑	-	-	-	-	-
The Bank of New York Me	0.4180%	-0.0138%	-0.0758%	☑	-	-	-	☑	-	-	-	-	-
Ford Motor Company (NY:	0.7984%	-0.0131%	-0.9118%	☑	0.2062%	0.0100%	0.0100%	☑	bb	-	-	-	-
General Motors Company	0.6277%	-0.0307%	-0.4692%	☑	0.1038%	-0.0034%	-0.0034%	☑	bbb	▲	-	bbb	-
Tesla, Inc. (NasdaqGS:TS	0.3646%	-0.0008%	-0.5061%	☑	0.0102%	0.0028%	0.0028%	☑	aaa	-	-	-	-
AbbVie Inc. (NYSE:ABBV)	0.3233%	0.0325%	0.0947%	☑	0.0718%	0.0204%	0.0204%	☑	a+	▼	-	-	-
Amgen Inc. (NasdaqGS:A	0.2855%	0.0124%	0.1854%	☑	0.0991%	-0.0795%	-0.0795%	☑	a-	-	-	-	-
Gilead Sciences, Inc. (Na:	0.1402%	0.0046%	-0.0718%	☑	0.0300%	0.0035%	0.0035%	☑	a-	-	-	-	-
Amazon.com, Inc. (Nasde	0.5579%	-0.0035%	-1.0403%	☑	0.2230%	0.0190%	0.0190%	☑	aa	-	-	-	-
Charter Communications,	3.5920%	-0.3158%	-1.4935%	☑	0.3392%	0.0102%	0.0102%	☑	bb+	-	-	-	-
Comcast Corporation (Na:	0.8445%	-0.0177%	-0.6409%	☑	0.1116%	0.0006%	0.0006%	☑	bbb+	-	-	-	-
Dow Inc. (NYSE:DOW)	0.4855%	-0.0335%	-0.3020%	☑	0.0550%	0.0257%	0.0257%	☑	bbb+	▼	-	-	-
Cisco Systems, Inc. (Nasr	0.0701%	-0.0015%	-0.2717%	☑	0.0528%	-0.0016%	0.0273%	☑	aa	-	-	-	-
Caterpillar Inc. (NYSE:CA	0.1766%	-0.0270%	-0.0599%	☑	0.0086%	-0.0054%	-0.0054%	☑	a+	-	-	-	-
American Express Compa	0.0979%	-0.0076%	-0.0684%	☑	-	-	-	☑	-	-	-	-	-

## 建議

台灣央行於 2022 年 7 月 21 日以「金融業導入人工智能 (AI) 的數位轉型應用」為題指出，目前 AI 應用於台灣金融領域主要有 9 大方向，包括：1. 認識客戶、2. 身分辨識、3. 簡化人工作業、4 提升信用評分系統、5. 監測交易風險、6. 智能客服、7. 理財諮詢、8. 精準行銷及 9. 詐欺偵測等，內容主要皆為銀行在於客戶進行相關交易之領域，仍未明顯擴及至銀行自行投資金融商品之領域。

根據此次參訪的同業結果，發現國際性之大型銀行已積極投入投資領域相關人工智能平台的開發及整合，打造一個如同 BlackRock(貝萊德)在 2000 年成立了貝萊德解決方案公司 (BlackRock Solutions)，開發出一個被稱作阿拉丁系統(Aladdin Platform)(依照 BlackRock 網站上介紹，Aladdin 這個平台能將複雜的風險分析與投資組合管理和交易工具都整合在一個平台上，幫助使用者做出更明智的投資決策且提高營運效率，達到有效管理投資風險的目的)，提升銀行多元業務獲利來源。

有鑑於投資領域之智能平台需求日增，近期亦吸引許多智能平台開發公司對投資、交易、風險管理、研究等領域積極開發相關平台，本次參訪 S&P Global Market Intelligence 開發之 Capital IQ platform 即是一例，經本次參訪及試用，其平台主要應用於投資前巨量研究資料整合，以及投資後即時監控之風險管理，仍未整合至交易端，惟對目前投資金融商品種類相對簡易，以及金融資產規模不大之國內銀行已屬足夠，但目前相關智能平台費用昂貴，成本效益考量下國內銀行同業短期引進意願不大，惟隨著 AI 應用日趨成熟，且相關 AI 設備成本亦逐漸降低，相信未來將吸引更多國內金融科技或開發公司投入開發較具經濟型之智能平台，提高使用者使用意願。

#### 四、參考文獻

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6. 112 年 9 月 21 日央行理監事會後記者會參考資料

