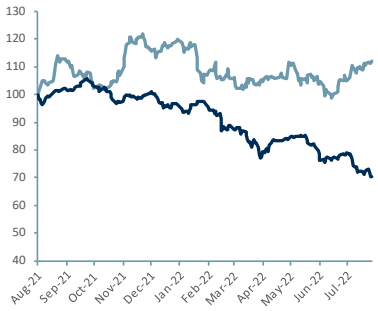
ACF EQUITY RESEARCH

CIC

Value Range

A$74.2–78.0



ASX (lighter line) ASX 50 market vs price relative

Friday, 29 July 2022

Close Price	88.26
52 wk Range Low	71.22
52 wk Range High	95.83
MCAP (bn)	$17.09
EV (bn)	$11.80
Index: Public	ASX
Financial YE	30-Jun
Reporting Currency	AUD
Listing Currency	AUD
Business Activity	
Market Exchange	

Key Metrics	
Gross debt (bn)	$0.07
Cash (bn)	$5.36
Net Debt (Cash) (bn)	-$5.29
Net Operating Cash (bn)	$5.20
Revenue (bn)	$1.04
Net Income (loss) (bn)	$0.49
Key Ratios	
(Net Cash) / Shareholder Equity %	30.94%

Financials Sector Research
ASX Market Index
ACF Financials Team
+44 20 7419 7928
financials@acfequityresearch.com

ASX Limited

Core Investment Case

ASX Limited (ASX: ASX) is Australia's primary securities exchange and one of the world's top 10 listed exchange groups by market capitalisation. Services include listings, trading, clearing and settlement, and other post-trade services. Trading products include interest rate derivatives, equities, fixed income, commodities and energy. ASX has a local monopoly in the Australian financial markets delivering attractive operating margins (EBIT adj. 1H22 64%). ASX's balance sheet is strong - gross cash position of A$5.3bn. ASX is enjoying a significant boom period underpinned by new listings and the global growth trend of greater retail investor market participation – Nevertheless, we see hard coded reasons for valuation caution.

- Monopoly exchange provider in Australia (multiple-asset classes);
- EBIT adj. margin 64%;
- Consistent dividend underpinned by 90% pay-out ratio policy;
- Cash & CE at A$5.3bn as of 31 Dec 2021.

AUD (bn)	MCAP	EV	RoA %	RoE %	NCO	Levered FCF
2022	17.09	11.80	2.61%	13.06%	5.20	0.44

Multiples	EV/ Revs	P/ S	Fwd PE	BV/ Share	P/ B	Current
2022	3.18	16.21	30.86	19.48	4.29	1.10

Investment Case

ASX Limited is the monopoly exchange in Australia offering listings, trading and post-trading services across multiple-asset classes. The monopoly plus an asset light business model ensures high margins, a 90% dividend pay-out ratio and positive free cash flow generation. However, there reasons for caution.

Market leading position – By MCAP ASX is one of the top 10 listed exchange groups globally. The ASX is the 4th largest interest rate derivatives market globally and the largest in Asia. In 2015, ASX launched its unique and innovative Deliverable Swap Futures (DFS) contracts. Compared to the OTC (over the counter) equivalent, DFS offers higher margins and better capital efficiency.

ASX has a monopolistic position in its home Australian market – we think this market is broadly saturated and largely ex-growth, irrespective of the 1H22 IPO performance.

We expect further growth to have to come from products launched into the global capital markets, which will face all the competitive and margin headwinds that that implies.

In our experience monopolists often struggle in truly competitive markets, at least initially.

Our analysis suggests that ASX's current 'monopoly' margin levels will be diluted because significant growth will only come from new products launched into global markets that will face lower margins.

Attractive margins and positive cash flow generation: The asset light nature of the company's business allows it to maintain high operating margins. In 1H22A published operating margins came in at 68%. EBITDA margin 69% and net income margin 47%. ASX's profitability is not wholly reflected in free cash flow generation. Net Cash from Operations (NCO) 1H22A A$213m vs. 107.6m y/y.

Technology strategy to support growth: ASX is transforming its technology platform with a particular focus on its equity technology stack. We assess this as largely a catch-up exercise. In December 2021, ASX launched its 'Electronics statements capability' (digital download of statements) supported by investors and brokers. By YE22, ASX expects to have completed its 'New equity data warehouse' delivering industry-standard data feeds. ASX's 'CHESS replacement' expected rollout is April 2023. The platform uses blockchain (VMware's DLT – distributed ledger technology) to improve core trading services but is unlikely to convey long-run competitive advantage.

Solid 1H22A results: In the 1H22A, ASX net operating revenue A$501.4m was up 6.6% y/y, despite the underperformance of derivatives, which at approx. AS$100m is the largest revenue line item. 1H22A futures + OTC revenues fell 5.7%. Strong results for listings and equities trading as well as greater demand for technology and data, partly offset lower futures volumes. Listings are likely to be down 2H22E.

Catalysts

Positives: Rollout of new investment products and services; Higher trading volumes; Continued investment in advanced technology to digitize trading. **Negatives:** Delays in platform rollout; Loss of monopoly status; Contracting home market revenues; Contraction in new issue and trading revenues.

Operational Strategy

ASX's operational strategy is focused on first bringing its technology stack up to date before advancing this stack to create a degree of technological advantage. This is a major transformational project for the ASX and as such will come with attendant roll out and design risk. However, assuming the transformation project is executed successfully it will enable Australia's financial markets to operate on a contemporary and flexible technology platform. ASX's management team intends to leverage its new operating platform to create future expansion opportunities.

Technology upgrade started in 2016: Since 2016, ASX has replaced and upgraded its trading systems, including communications infrastructure, data centres, risk management and surveillance systems.

ASX is replacing CHESS, its clearing and settlement system, with a new blockchain-based platform using distributed ledger technology (DLT). DLT will create more opportunities for the Australian market by increasing trading functionality and will permit the adoption of global clearing standards. The CHESS transformation is expected to go live in April 2023.

By providing a clearing system that is technologically comparable with other major global exchanges, ASX has the opportunity to share in greater trading volumes, to launch cross border products and create a more attractive listing venue for corporates.

In addition, ASX has significantly reduced operational system **downtime/failure rates** over the last five years. **System failure rates have fallen by ~90%** (RNS Sep 2021).

Expanding products and services: ASX is focused on expanding its products and services, which includes growing the number of listed companies as well as introducing new investment products. Over the last six years, ASX has attracted domestic and international technology listings and the number of exchange-traded products since YE15A has doubled. As of Sep 2021, ASX has grown its exchange traded products (ETPs) in global equities, fixed income and active strategies.

Below we show comparative revenue growth and mix by operational revenue segment **before and after the operating revenue lines re-organization**.

The reorganization has a clear logic but does not yet provide us with sufficient comparable numbers. For the YE22E results it would be helpful to see a proforma presentation of reorganized operational revenue back to YE20A.

Exhibit 1: **ASX revenues YE21A vs. YE20A (pre reorganization)**

ASX Revenue Lines AS$(m)	YE21A	2H21A	1H21A	YE20A	YE21/YE21 Gr %
Listings & Issuer Services	258	131	128	237	8.9%
Mix %	27%	27%	27%	25%	
Derivatives & OTC Markets	285	140	145	318	(10.4)%
Mix %	30%	29%	31%	34%	
Trading Services	265	135	130	256	3.4%
Mix %	28%	28%	28%	27%	
Equity Post-Trade Services	144	76	68	127	12.8%
Mix %	15%	16%	14.5	13.5%	
Operating Revenues	951	481	470	938	1.4%

Sources: ACF Equity Research; Company reports.

New Operating Revenue Lines (with % contribution to total revenues)

- **Listings (21%)** - 1^{O} listings; 2° raises; investment products.

Previously named Listings (19%) and Issuer Services (8%).

- **Markets (28%) -** Futures, OTC Markets, Equity Options (21%), Cash market trading (7%).

Previously named Derivatives & OTC Markets containing equity options (1%), futures and OTC clearing (23%) and Austraclear (6%).

- **Technology & Data (22%)** - Information services (13%); Technical Services (9%).

Previously named Trading Services capturing Technical Services (9%); Information Services (12%) and Cash Market Trading (7%).

- **Securities and Payments (29%)** – Issuer services (8%); Cash Market Clearing (8%); Cash Market Settlement (8%) Austraclear (5%).

Previously named Equity Post-Trade Services capturing Cash Market Clearing (7%) and Cash Market Settlement (7%).

Exhibit 2: **ASX operating revenue reorganization 1H21A to 1H22A**

ASX Revenue Lines AS$(m)	1H22	2H21	1H21	1H22/1H21 Gr %
Listings	104	94	89	17.0%
Mix %	21%	19.5%	19%	
Markets	142	141	146	(2.6)%
Mix %	28%	29%	31%	
Technology & Data	109	105	99	10.1%
Mix %	22%	22%	20.5%	
Securities & Payments	147	140	137	6.9%
Mix %	29%	29%	29%	
Operating Revenues	501	481	470	6.6%

Sources: ACF Equity Research; Company reports.

Exchange Business Breakdown & Outlook

Cash Market businesses (36%) – Cash Market Trading, Clearing, Settlement, Austraclear and Issuer Services.

Cash Market Trading or Cash equities - In relation to investing, cash equity or the cash equities business refers to the common/ordinary stocks issued to the public and the institutional trading of such stocks.

Cash market trading revenues rose 8.1% 1H22A y/y driven by an increase in the value of the market for equities. Total ASX on-market value rose 5.7% 1H22A y/y.

Cash equities trading is trading conducted by large, institutional investors in which they trade in shares both on their own behalf and on behalf of clients.

Cash Market Trading or cash equities growth we believe is itself underpinned by a rise in retail investment and trading in markets – this force can change direction rapidly. Retail investors leverage and react to social media trends and memes and retract from markets in severe downturns.

Cash equities trading by institutions is a short-term trading strategy (positions are taken with weekly, daily, hourly or shorter time horizons) with the goal of taking advantage of quick and substantial profit opportunities created by stock market fluctuations (volatility).

An exchange business such as ASX collects transaction fees from market participants and companies trading on the exchange.

Clearing – In general terms, clearing is the accurate and timely execution of financial instrument transactions (equities, futures, derivatives, bonds, etc.).

Clearing has two fundamental steps – **a)** the transfer of funds to the seller and **b)** the transfer of securities to the buyer.

Clearing is a specialized financial markets function carried out by a clearinghouse, which is an intermediary between seller and buyer. The clearinghouse performs the function of a neutral buyer and seller to reconcile orders between the transacting parties in the financial markets.

Clearing is an essential function in capital markets in order that all buy and sell orders are matched to ensure markets function efficiently and that market participants have confidence that the market operates effectively – clearing should ensure that the buyer gets the assets ordered quickly and the seller gets its cash quickly.

OTC clearing – Many securities are traded via broker dealer networks rather than formal centralized stock exchanges, such as ASX. OTC clearing is essentially a less efficient system involving a relatively smaller number of buyers and sellers and participants willing to function as intermediaries.

In OTC markets there are fewer parties trying to establish a price. Nevertheless, many securities, particularly those of smaller companies but also very large corporations, are traded this way.

OTC trades still require a clearing service. Therefore, although the trade is not carried out on a formal centralized exchange such as ASX, the stock exchange does provide the clearing service and so generates revenues from this important market segment.

Austraclear - including the Sympli investment - Austraclear is a clearing service that offers instant and irrevocable exchange of cash and security ownership. The system and service reduce settlement risk for clients, speeds up trade administration and reduces the overall cost to trade.

Driver – 1H22A y/y Austraclear holdings balance grew 8%.

Revenue development (including Sympli acquisition) contracted 11.3%.

Settlement - Settlement is the process of transferring funds (cash) through a central agency, from payer to payee, and is executed by their respective banks or fund custodians.

In equities trading, settlement is referred to as transaction or trade date (T), which is the moment the trade was executed, i.e. the order to buy or sell was placed and satisfied, plus the number of days both parties must wait respectively to receive ownership proof and cash.

The abbreviation T+3 means that settlement will occur 3 days after the trade or transaction date. Most equity (stock) trades are now settled on T+2, meaning the buyer receives the proof of ownership two days after the trade date and the seller receives cash two days after the trade date.

ASX business units and revenue lines reorganisation 2022

The exhibits below show revenue attribution after and before the ASX reorganization of its business units in 2022. The colour coding in the pre re-organiazation 2021 exhibt shows which units ended up where in the new structure.

The reorganisation in 2022 has an inescapable logic. It also moves trading activities down into 2nd position in terms of revenue generation and promotes post-trade services (securities & payments) into first position.

Technology & Data services are now a clear well-defined unit. In our assessment, this unit is a future spin out or trade sale opportunity.

Overall, the reorganisation presents a business in which 51% of revenues are reliant on front line capital markets activities (primary and secondary money raising, secondary equities trading, derivatives, OTC trading), which we assess are going ex-growth for ASX in its home market, in spite of recent listings successes.

Exhibit 3: **ASX business units revs contribution post reorg 2022**

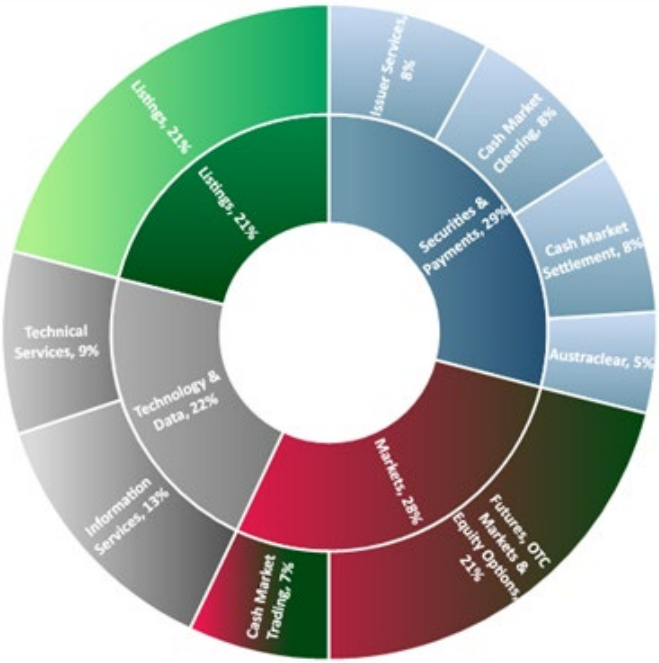
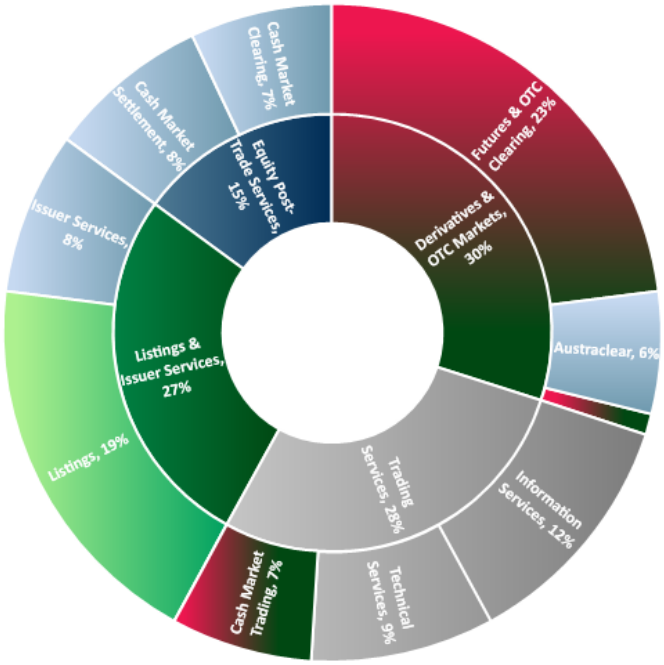


Exhibit 4: **ASX business units revs contribution pre reorg 2021**



Sources: ACF Equity Research; Company reports.
*Equity options account for 1% of Derivatives & OTC Markets unit (segment not annotated in exhibit).

Growth driven by rise in number and size of IPOs and secondary raises – at risk in a market correction of crash.

Issuer services – These are services provided to issuers of stock or investment instruments by the stock exchange to improve the effectiveness of a public listing. The services may be provided by the exchange directly or by third party providers, recommended, endorsed or simply advertising on an exchange's platform.

An example of a third-party issuer service is equity research. More explicitly, ASX offers the CHESS register (which provides shareholder information and which is undergoing a major upgrade), legal title, settlement for IPO allocations, takeover and buy-back acceptances. ASX also provides engagement services and other tools and resources for issuers.

Driver – CHESS holding statements 1H22A y/y up 7.6%.

Revenue development Issuer services 1H22A y/y up 9.6%.

Technology and Data (22%)

Solid pay to play business benefitting directly from a rise in IPOs and secondary raisings and the global trend of greater retail participation in markets.

Connectivity - ASX's Technology and Data business unit joins market participants together to the central ASX exchange platform, allowing counterparties to participate in the markets and use ASX's other services such as those associated with the Cash Markets.

Data - The unit also provides participants with key volume data essential to effective business in capital markets, e.g. historical pricing, spreads, volumes etc.

Business model - This business is a way of charging for the infrastructure that ASX (or any other exchange) provides in order that it can create a valuable trading venue for participants. Broadly, participants could not afford to create this venue individually. It is essentially a 'pay to play' model for participants and is a model used by all exchanges.

Drivers – Australian Liquidity Centre (ALC) cabinets and cross connections. The ALC is the infrastructure that allows participants / counterparties to connect to both the exchange's markets and to one another. It is a colocation facility, which can be generally characterized as a shed with many servers, air conditioning, power supply, IT support and large-scale high-volume telecommunications interconnectivity.

Revenue development between 1H22A y/y ALC cabinets grew 7.0% and ACL cross connections grew 6.3% leading to revenue growth for the Technology and Data unit of 10.1% over the same period.

Listings – IPOs, secondary raises and investment products

At risk of contraction with some worrying historical parallels.

On the one hand the IPO market has been strong for ASX, with particular success in IPOs grouped as Tech IPOs. The market capitalization of new listings has also grown, which drives a rise in fee income. Both the primary listings (IPOs) and secondary raises numbers in 1H22A, have been the highest booked since just before the 2008/09 market crash.

Drivers – Number and size of market capitalization of new listings, up 76.5% and 67% respectively 1H22A y/y.

Revenue development 1H22A y/y, listings revenues up 17%. Listings are broken out further as annual listing revenues, up 22.3%; initial listings, up 22.9% and secondary raises, up 11.7%. Investment product revenues contracted 5.5%.

Derivatives – futures and options trading

Rise of retail investor coordination and success may be forcing a tactical and strategic re-think by professional and institutional traders.

ASX's derivatives market revenues have contracted. We surmise that there may be a connection between the contraction in derivatives trading and a tactical re-think by professional and institutional traders executing shorting strategies.

We assess that this reappraisal has been driven by a rise in retail traders coordinating via social networks in a series of well publicized and successful short squeezes.

Drivers – 1H22A y/y futures volumes down 8.2%; Single stock options volumes down 1.8%.

Revenue development 1H22A y/y – Markets revenues down 2.6%. This can be broken out further into Futures and OTC revenues down 5.7% and equity options down 3.6% 1H22A y/y.

Future challenges

ASX is updating its technology platforms in order to remain competitive in a global equities market and to drive innovation and so new revenue lines. In our view the home market has reached relative saturation in spite of 1H22A successes.

We conclude that new revenue streams will be subject to global market competition and that monopoly revenues and associated margins will either be eroded away or become diluted by lower margin business subject to global competition.

Whilst we are highly supportive of ASX's investments to upgrade its technology platforms, it seems improbable that these investments will convey more than 24 months competitive advantage. This suggests that either platform capex will become a de-facto maintenance capex item or that ASX faces becoming globally uncompetitive.

Management Team – Departures

➢ CEO, Dominic Stevens.

On 1st Jan 2016 ASX's s/p was ~A$ 42. ASX's current 52-week high s/p is AS$ 95.83.

Dominic Stevens is retiring as ASX's CEO 31 July 2022 – He will advise and assist ASX with transition to the new CEO until 30 Sept 2022. His replacement is Helen Lofthouse

Dominic was appointed Managing Director and CEO of ASX in August 2016. Between December 2016 until his appointment of CEO, he was an independent non-executive director of ASX. Dominic has 30+ years' experience in financial markets. Prior to ASX, he was the CEO of Challenger Limited from 2008-2012, and has held senior positions at Bankers Trust Australia with a focus on derivatives business, global metals and agricultural commodities. Dominic has also served as a Senior Managing Director at Zurich Capital Markets Asia and on the board of SocietyOne Australia. He is a finance graduate of The University of New South Wales (NSW)

➢ Chief Financial Officer, Gillian Larkins.

Gillian Larkins will leave ASX end August 2022 to pursue other opportunities. A search for a new CFO has commenced.

Gillian was appointed CFO of ASX in October 2018. As CFO she is responsible for the ASX's Finance, Treasury, IR, ESG and National Facilities. Gillian has 25+ years' experience in finance and management roles. Prior to ASX she was the CFO of Perpetual Limited, CFO and Managing Director of Westpac Institutional Bank, and CFO for Australia New Zealand at Citi Bank. She is an economics graduate from the University of Otago and was awarded her MBA from Macquarie Graduate School of Management (MGSM).

➢ Chief Compliance Officer, Janine Ryan.

Janine Ryan will leave ASX end September 2022. Group General Counsel, Daniel Moran, will become acting chief compliance officer in her place

Janine was appointed Chief Compliance Officer of ASX in May 2020 where she oversees compliance and enforcement. Janine has 24+ years' experience as a lawyer with a focus on capital markets, M&A and corporate, regulatory and governance. Prior to becoming CCO, Janine was the General Manager of Legal at ASX. From 2008-2013, she was a partner at Gilbert + Tobin. Janine obtained her Masters in Law (LLM) degree from the University of Sydney

Risks

Regulatory risk – ASX operates in highly regulated markets. Any changes in regulations or market structure can increase competition for ASX or decrease the demand for the products or services of ASX. Such unfavourable changes could be detrimental to the business prospects of ASX.

Clearing house risk – Through its clearing house activities, ASX is exposed to the potential loss that may arise from the failure of a counterparty to meet its obligations. Failure of clearing participants to meet these obligations exposes ASX to potential losses.

Global macroeconomic risk – As a provider of financial infrastructure, ASX operates across a range of equity, fixed income, derivatives and currency products. A global recession could lead to reduced activity in the markets which could adversely impact ASX's revenue.

Technology risk - ASX operations and brand are highly dependent on the reliable functioning of its sophisticated technology infrastructure. Any technology failure could result in system outages, thereby impacting orderly functioning of the capital markets. This in turn leads to lost revenue and damage to global and local confidence in the ASX offering.

The current technology transformation projects come with their own inevitable execution and rollout risk. However, if ASX were to curtail its continued investment in its technology transformation programme, ASX risks loss of competitiveness and potential irrelevance in a digitized capital markets environment.

Value Range A$74.2–78.0

Trading Multiples Valuation

Exhibit 5: **ASX Limited peer group metrics**

TTM Metrics / Company Name	Market	Tkr	EV $(m)	Revs $(m)	EBITDA $(m)	FCF $(m)	Staff	GM%	EBITDA M%	EBIT M%	FCF M%
ASX	**XASX**	**ASX**	**8,243**	**726**	**508**	**308**	**749**	**93.4%**	**70.0%**	**68.5%**	**42.3%**
Intercontinental Xchg	XNYS	ICE	70,770	7,250	4,430	2,020	9,009	98.6%	61.1%	50.2%	27.9%
London Stock Xchg	XLON	LSEG	61,266	8,200	3,066	2,725	23,261	87.2%	37.4%	22.6%	33.2%
Deutsche Boerse	XETR	DB1	40,489	4,649	1,952	718	10,200	75.4%	42.0%	39.2%	15.5%
OTC Markets	OTCM	OTCM	620	92	40	34	82	98.0%	43.3%	41.4%	37.0%
Average							10,638	89.8%	45.9%	38.3%	28.4%
Median							9,605	92.6%	42.6%	40.3%	30.5%

Sources: ACF Research Estimates; Companies reports; Thomson Reuters.

Exhibit 6: **ASX Limited peer group multiples**

TTM Metrics / Company Name	Market	Tkr	MCAP US$(m)	EV $(m)	EV / REVS	EV / EBITDA	EV / FCF	EV / NI	PER	P/ sales	P/ book
ASX	**XASX**	**ASX**	**11,935**	**8,243**	**11.35x**	**16.21x**	**26.79x**	**24.11x**	**34.91x**	**16.21x**	**4.29x**
Intercontinental Xchg	XNYS	ICE	56,938	70,770	9.76x	15.98x	35.03x	17.39x	14.16x	5.89x	2.36x
London Stock Xchg	XLON	LSEG	54,319	61,266	7.47x	19.98x	22.48x	95.20x	82.18x	6.14x	1.81x
Deutsche Boerse	XETR	DB1	33,101	40,489	8.71x	20.75x	56.37x	30.25x	23.30x	6.45x	3.74x
OTC Markets	OTCM	OTCM	649	620	6.70x	15.48x	18.09x	20.30x	20.87x	6.72x	23.58x
Average					8.16x	18.05x	32.99x	40.78x	35.13x	6.30x	7.87x
Median					8.09x	17.98x	28.76x	25.28x	22.08x	6.30x	3.05x

Sources: ACF Research Estimates; Companies reports; Thomson Reuters.

We exclude the subject company of this investment research note from the average and median values in order to make comparison with the rest of the peer group as undistorted as possible. We also rely more on the median values as the median is a statistically better indication of central tendency than the average.

ASX is smaller than its true international peers (OTC is a less good peer) and has less international competition experience currently (it is a monopoly exchange) vs. its peers. We assess that there is little fundamental underlying growth in the home Australian market, despite recent successes. ASX is investing in its technology platform to remain competitive. In our assessment, any new products will be exposed to international competition and similar margin constraints. Therefore, we infer that ASX's current high margins will begin to trend towards those of the peer group. ASX's technology transformation is unlikely to provide it with a competitive advantage for more than 24 months. There is also the risk of lower new issues revenues due to current global economic headwinds. These factors lead us to conclude that ASX should be valued at a discount to its peers.

Notes [Intentionally Blank]

INDEPENDENCE & DISTRIBUTION

ACF Equity Research Ltd is a provider of issuer-pays research with a clearly defined independent ethic. ACF produces accurate, clear, focused research aimed at a professional investment audience. ACF has excellent distribution capabilities and always aims to provide access without restriction to the widest professional audience. ACF offers a range of additional services to support its clients.

DISCLAIMER

This communication is for informational purposes only. It is not intended as an offer or solicitation for the purchase or sale of any financial instrument or as an official confirmation of any transaction. [The opinions expressed in this report herein do not take into account individual investor circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein.] ACF Equity Research Ltd has based this document on information obtained from sources it believes to be reliable, but which it has not independently verified. Neither ACF Equity Research Ltd. nor any of its directors, officers, employees or agents shall have any liability, however arising, for any error, inaccuracy or incompleteness of fact or opinion in this research report or lack of care in this research report's preparation or publication, or any losses or damages which may arise from the use of this research report. All market prices, data and other information are not warranted as to completeness or accuracy and are subject to change without notice. [Past performance is not necessarily a guide to future performance and no representation or warranty, express or implied, is made by ACF Equity Research Ltd. with respect to future performance. Any recommendation or opinion contained in this research report may become outdated as a consequence of changes in the environment in which the issuer of the securities under analysis operates, in addition to changes in the estimates and forecasts, assumptions and valuation methodology used herein.]

IMPORTANT DISCLOSURES FOR U.S. INVESTORS

This research report was prepared by ACF Equity Research Ltd., a company authorized to engage in securities activities in the United Kingdom. ACF Equity Research Ltd. is not a registered broker-dealer in the United States and, therefore, is not subject to U.S. rules regarding the preparation of research reports and the independence of research analysts. This research report is provided for distribution to "major U.S. institutional investors" in reliance on the exemption from registration provided by Rule 15a-6 of the U.S. Securities Exchange Act of 1934, as amended. Any U.S. recipient of this research report wishing to effect any transaction to buy or sell securities or related financial instruments based on the information provided in this research report should do so only through, a registered broker-dealer in the United States. The analyst who prepared this research report is not registered or qualified with the Financial Industry Regulatory Authority ("FINRA") and may not be associated with a U.S. broker dealer and as such, would not be subject to applicable restrictions under FINRA Rules on communications with a subject company, public appearances and trading securities held by a research analyst account.

[Investing in any non-U.S. securities or related financial instruments (including ADRs) discussed in this research report may present certain risks. The securities of non-U.S. issuers may not be registered with, or be subject to the regulations of, the U.S. Securities and Exchange Commission. Information on such non-U.S. securities or related financial instruments may be limited. Foreign companies may not be subject to audit and reporting standards and regulatory requirements comparable to those in effect within the United States.]

LEGAL NOTICE

This report is for authorized use by the intended recipient(s) only. It may contain proprietary material, confidential information and/or be subject to legal privilege. No part of the content of this research report may be copied, forwarded or duplicated in any form or by any means without the prior consent of ACF Equity Research Ltd. and ACF Equity Research Ltd. accepts no liability whatsoever for the actions of third parties in this respect.

IMPORTANT ADDITIONAL DISCLOSURES FOR U.K. INVESTORS

The information in this report has been prepared by ACF Equity Research Ltd (ACF). The research is published for information purposes only. It is not intended as an offer or solicitation for the purchase or sale of any securities or any financial instruments.

ACF has based this document on information obtained from sources it believes to be reliable but which it has not independently verified. All market prices, data and other information are not warranted as to completeness or accuracy and are subject to change without notice. Any comments or statements made herein do not necessarily reflect those of ACF Equity Research Limited. The material should not be regarded by recipients as a substitute for the exercise of their own judgment. Past performance does not guarantee future performance.

The analyst(s) responsible for covering the securities in this report receive compensation based upon, among other factors, the overall profitability of ACF which may, from time to time, solicit business from any of the companies referred to in this report. The analyst(s) responsible for covering securities in this report may not hold a position in any or related securities in this report in ACF's sector universe on in any other sector in which ACF carries out research. The company does not hold any position in the securities mentioned in this report.

This research report and its contents are intended for professional investors and not for retail investors. A marketing communication under FCA Rules, this document has not been prepared in accordance with the legal requirements designed to promote the independence of investment research and is not subject to any prohibition on dealing ahead of the dissemination of the investment research. ACF Equity Research Limited is authorised and regulated by the Financial Conduct Authority. However the contents of this research report are produced as if ACF Equity Research Limited is unregulated and consequently this report does not contain investment recommendations or ratings.

ACF, its directors, employees and agents accept no liability whatsoever for any loss or damage of any kind arising out of the use of all or part of these materials. The information in this report is provided with the understanding that ACF is not acting in a fiduciary capacity. Certain laws and regulations impose liabilities which cannot be disclaimed. This disclaimer shall in no way constitute a waiver or limitation of any rights a person may have under such laws and/or regulations. Copyright © 2018 ACF Equity Research all rights reserved. Additional information is available upon request.

ACF Equity Research Limited, 125 Old Broad Street, London, EC2N 1AR, U.K.
Tel: +44 (020) 7558 8974
Website: www.acfequityresearch.com