Mining Strategy
Diamonds: encouraging expert call

Equities

Global
Mining

Myles Allsop
Analyst
myles.allsop@ubs.com
+44-20-7568 1693

Daniel Major
Analyst
daniel.major@ubs.com
+44-20-7568 3472

Hugo Bravery
Analyst
hugo.bravery@ubs.com
+44-20-7568 7202

Glyn Lawcock
Analyst
glyn.lawcock@ubs.com
+61-2-9324 3675

Diamond market: encouraging update with leading diamond consultant

We hosted a call with a leading independent diamond consultant on 14-Jun to discuss the diamond market outlook. Overall, the call was encouraging with demand picking up with GDP in the key markets (US, China), supply set to fall with the closure of various mines over next few years, inventories low, and polished prices starting to lift. In terms of risks, mid-stream financing concerns are easing, advertising is picking up, and De Beers is taking control of the synthetic market. The replay details are below. In our opinion, this call is encouraging for Anglo American (Neutral).

Demand: US & China stronger than expected in 2018, but expect to moderate

The US accounts for ~50% of global diamond demand with China ~20% & India ~8%. Demand growth is highly correlated with GDP growth and as such Chinese & Indian markets are the fastest growing. In 2018, retail sales are ahead of expectations in the US (Tiffany, LVMH, Signet) and China (Chow Tai Fook delivering 5 consecutive quarters of same store sales growth and net new store openings lifting materially); India is subdued due to the bankruptcy of the Modi retail business. Global consumer diamond demand is set to grow c+4% y/y in 2018; growth will slow in 2019-20 with slower global GDP growth.

Supply: Rough stone production set to fall through 2021 as old mines exhaust

Supply is set to decline over 3-4yrs with a number of mines reaching end of life (Argyle, Victor, Voorspoed, Namibia alluvial). Alrosa's Jubilee mine will also halve production to 5Mcts by 2020 as resource depletes & Mir will remain offline until past 2020. Currently there are only two new mines in development globally: Luaxe in Angola & Alrosa's Verkhne-Munskoye project; Zimbabwe also has potential to lift supply. New mines have a long lead time of 5-10yrs. Rough inventories are low. De Beers is looking to steer synthetics into a different category with Lightbox (by making synthetic diamond prices linear when currently at 30-40% discount to natural). The diamond recycled market should remain relatively small (<3mCts) with consumers reluctant to sell (discount, attachment)

Prices: polished price expected to lift and support higher rough prices

Polished diamond prices started to lift in Q1 for the first time in 3yrs; with demand robust (and supported by increased advertising) our expert sees potential for this to continue and in turn support higher rough prices.

Key takeaways from expert call

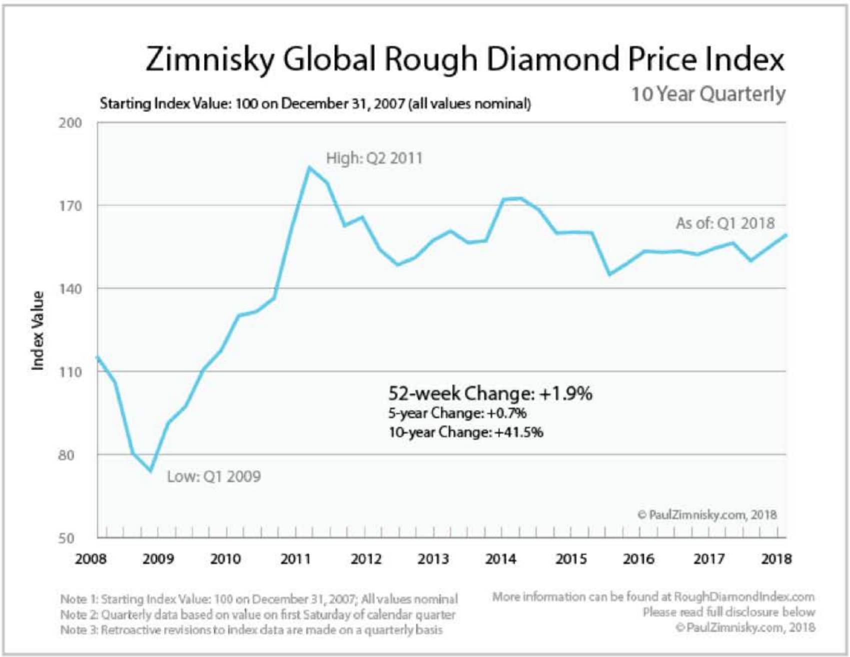
UBS hosted a call with Paul Zimnisky, a leading independent diamond consultant on 14th June to discuss the outlook for diamonds. Paul covered price trends (polished and rough), the supply & demand outlook and inventory levels as well as the challenges from synthetics, mid-stream financing and changing consumer habits. The replay details are: +44 207 136 9233 (Link for other replay numbers); Passcode: 90969896

Prices: starting to pick up after downtrend

Like for like rough diamond index prices are up 42% in the last decade

Rough diamond prices have risen 42% in the last decade however much of this was in 2008-2011 after the global financial crisis when prices rebounded in just over two years from Q1 2009 to Q2 2011 led by engagement jewellery demand growth in China. Over the last five years prices have seen a moderate downtrend however there has been a pick-up over the last 6 months. Prices hit a 52-week high in May but are still well below previous highs in 2011 and 2014. Zimnisky believes this recovery is the result of structural changes in the diamond market with both demand (US robust, Chinese consumer demand growth strong) and supply (mine depletion and inventory destocking) supportive as discussed below.

Figure 1: Zimnisky global rough diamond price index



- **Jewelry demand: +50%**
  - 2018E: $176B
  - 2008: $117B
- **Diamond jewelry demand: +47%**
  - 2018E: $87B
  - 2008: $59B
- **Polished diamond end-demand: +32%**
  - 2018E: $25B
  - 2008: $19B
- **Rough diamond production: +33%**
  - 2018E: $16B
  - 2008: $12B

Source: Paul Zimnisky diamond analytics Note: All global figures are based on **nominal** estimates

Demand robust with global GDP

Over the last 10 years polished diamond end demand has grown around 32% from US$19bn in 2008 to estimated $25bn in 2018. At the same time diamond jewellery demand has grown 27% in real terms from US$59bn to $87bn over the same period. Global consumer diamond demand is forecasted to grow at a nominal 4% in 2018 as illustrated below. This is driven by robust US growth and the return of Chinese growth.

Figure 2: Nominal global polished demand growth

Nominal Global Polished Demand (USD, Bil)	Jewelry		Polished Diamond	
	Jewelry	Diamond Jewelry	Diamond	Nominal Growth
2016A	$156.9	$78.4	$22.7	6.0%
2017A	$167.1	$82.7	$23.8	4.6%
2018	$175.8	$87.0	$24.8	4.2%
2019	$183.8	$90.0	$25.7	3.7%
2020	$192.2	$94.2	$26.4	2.6%
2021	$200.9	$98.4	$27.6	4.5%
2022	$210.0	$101.8	$28.5	3.5%

Source: Paul Zimnisky diamond analytics

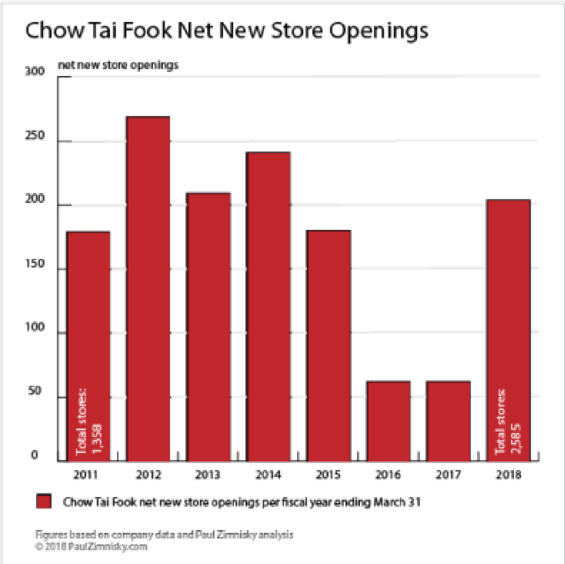
The US is the "anchor" for global diamond demand accounting for almost 50% of the market. Both Tiffany & Co and US jewellery retailer Signet beat earnings expectations with their Q1 2018 results while other US jeweller sellers noted continued strength in sales. Fine jewellery (>$1000 value) has been losing market share to fashion jewellery (<$500-700) however retailers have been reducing the value of diamonds in jewellery to maintain consumer spending.

In China (~20% of demand) the growth of the middle class has seen consumer demand migrate towards less expensive, lower quality diamonds similar to the demand profile in the US. The Chinese government has also taken steps to incentivise more consumer consumption domestically including announcing that it would cut import tariffs on gemstones from 35% to 10% as of 1st July 2018. The large Chinese jewellers are positive on consumer demand in 2018 on the back of stronger same store sales over the last year, a stronger yuan and increasing consumer confidence.

India, the 3rd largest (~8%) and fastest growing consumer market is being spurred by the growing affluent middle class and by population growth which is approaching that of China (1.3bn). The recent Nirav Modi and Mehul Choksi alleged fraud is expected to exceed US$2bn and is impacting demand with their bankrupt retail business having ~50% market share in India. The impact so far on midstream financing has been less than feared. The event may encourage consolidation among the midstream operators.

Figure 3: Diamond demand trends

Demand: China, India fastest growing markets, U.S is anchor



- Global diamond demand growth highly correlated with global GDP growth
- U.S. represents about 50% of global demand, China number two market approaching 20%, India number three at about 8%
- Greater China-proxy Chow Tai Fook number of stores increased from 1,358 in 2011 to 2,585 in fiscal year ending March 2018
- So far in 2018:
  - In Q1, Tiffany & Co, LVMH (Bvlgari) and U.S.-proxy Signet all beat earnings expectations
  - Mainland China retail jewelry sales up 7.9% in Q1 according to Bureau of Statistics
  - But...global economic growth expected to slow in 2019-2020 according to World Bank (June 5, 2018)

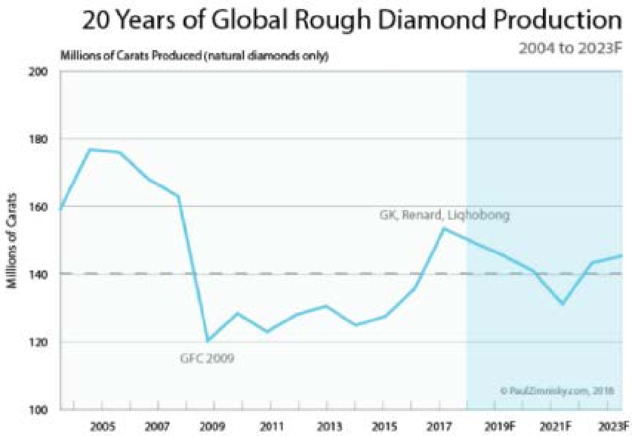
Source: Paul Zimnisky diamond analytics

Supply set to fall with mines depleting

Russia and Botswana are the top countries for diamond mining by volume and value. Mined diamond supply by total carats peaked in 2005 at around ~175Mcts before dropping sharply to a low of 120Mcts during the GFC in 2009. Supply has recovered since with output at ~150Mcts in 2017 however ageing mines and long lead times are forecast to lead to supply falling through 2021 as illustrated below.

South Africa, Namibia, Russia and Canada are the main diamond mining centres.

Figure 4: 2003-2023 Global rough diamond production



Nominal Global Rough Supply	Volume		Nominal Value	
	Carats (M)	YoY Change	USD (Bil)	Nominal Growth'
2016A	135.6	6.4%	$14.2	2.2%
2017A	153.4	13.1%	$15.5	9.5%
2018	149.0	-2.7%	$15.8	2.9%
2019	145.5	-2.4%	$15.7	0.6%
2020	140.9	-3.1%	$15.6	0.6%
2021	132.1	-6.3%	$15.8	1.9%
2022	140.6	6.4%	$16.8	7.5%

Source: Paul Zimnisky diamond analytics

In 2018, global natural diamond production is expected to fall 2.7% to 149mCts with De Beers and Alrosa forecasting a decrease in production. Over the last few years, the major producers have curtailed supply when deemed necessary to restore the supply/ demand balance; De Beers is currently operating at 95% of capacity and Alrosa at ~90%. Excess inventory levels for both producers has fallen significantly since 2015 with De Beers' now estimated at 3mCts and Alrosa at <2mCts.

Zimnisky expects rough diamond supply to decline by ~20mCts over the next 4 years and the market to be in deficit. The main drivers of falling supply are:

- **Argyle**: the last year of production at Rio Tinto's underground Argyle mine in Australia is expected to be 2019, based on current reserves. This mine produces 10-12mCts pa (down from peak of 40-50mCts) though the quality of the stones is relatively low (albeit there are some fancy pink stones). Rio has the potential to invest more in the underground block cave to extend the life though the economics are questionable (especially after the previous investment).

- **De Beers:** three of De Beer's older operations (Victor, Voorspoed, and the alluvial mines in Namibia) are approaching end of life and are all expected to be closed in the next 3-4 years. These operations are however relatively small, only producing ~2mCts in 2017.

- **ALROSA's** largest mine, Jubilee, is set to decrease from an estimated 10mCts in 2017 to 5mCts by 2020 as the mine depletes. Alrosa also expects no production from Mir until at least 2020, after a flooding incident in summer 2017 halted production; the mine had a production capacity of 3mCts annually.

There are current 2 mines which are in development, the **Luaxe** project in Angola and Alrosa's **Verkhne-Munskoye** project. Luaxe has the potential to be a top 5 diamond mine in the world but is currently expected to have annual production just in excess of 1mCts. ZCDC, Zimbabwe's government-run diamond unit, has plans to ramp up to 10mCts annually by 2022 at the recently nationalised Marange operations; this iis to be supported by a $400m investment over the next 5 years.

Figure 5: Estimated rough inventory levels of major producers 2013-2018

5-YR Inventory Analysis of Industry Leaders

De Beers

	Production	Sales	Inv. Chg.	Est. Inv.
2013	31.2	29.8	1.4	14.8
2014	32.6	34.4	-1.8	13.0
2015	28.7	20.6	8.1	21.1
2016	27.3	32.0	-4.7	16.4
2017	33.5	35.1	-1.6	14.8
2018[1]	8.5	8.8	-0.3	14.5

De Beers' estimated normal operating inventory: **~11M Carats**

Est. excess inventory: **3M Carats**

ALROSA

	Production	Sales	Inv. Chg.	Est. Inv.
2013	36.9	38.0	-1.1	17.5
2014	36.2	39.6	-3.4	14.1
2015	38.3	30.0	8.3	22.4
2016	37.4	40.0	-2.6	19.8
2017	39.6	41.2	-1.6	18.2
2018[1]	7.4	13.2	-5.8	12.4

ALROSA's estimated normal operating inventory: **~13M Carats**

Est. excess inventory: **<2M Carats**

Figures in millions of carats.
[1]2018 figures through Q1.

Source: Paul Zimnisky diamond analytics

Figure 6: Key risks which the industry faces

Three primary challenges facing the industry

- **Supply chain opacity and consumer trust**
  - *Implication*: Current generation has been significantly exposed to negative industry PR surrounding unethical sourcing and environmental impact of diamond mining
  - *Industry response*: Increase supply chain transparency via blockchain and other new technology; branded diamonds; personalized customer experience and custom jewelry
- **Changing consumer preferences and declining marriage rates**
  - *Implication*: Newer generations spending less on luxury, declining marriage rates
  - *Industry response*: Return of generic marketing via DPA targeting Millennials, non-married couples and self-purchasing women
- **Lab-created diamonds**
  - *Implication*: Lab-created diamonds taking market share from natural and undermining value
  - *Industry response*: Strategic bifurcation of product via Lightbox

Source: Paul Zimnisky diamond analytics

Figure 7: De Beers synthetic strategy views

De Beers' Lightbox:

- **To begin selling in September 2018**
  - Price range $200 to $800
  - Four size offerings only: 1/4, 1/2, 3/4 and 1-carat
  - Available in three colors: white, blue and pink
- **Strategy of differentiating LD diamonds from natural**
  - Undercuts current LC equivalents by as much as 80%[1]
  - Sub-$1,000 for 1-carat same price category as moissanite
  - Price differential in sizes will be linear
  - Price across color will also be consistent
  - Diamonds will not be graded

Image source: Lightbox

[1]Based on an analysis of surveyed lab-created diamond prices in May 2018 from prominent online retailers, specifically 1-carat diamonds round in shape, VS in clarity, F-H in color, VG- ideal cut, with no-to-low fluorescence. Since Lightbox diamonds will be sold as ungraded an exact price comparison cannot be made, however it is reasonable to believe that Lightbox stones will be in the VS category and near-colorless (probably with irradiation) given that Element Six is the industry leader in synthetic production capability.

Source: Paul Zimnisky diamond analytics

Valuation Method and Risk Statement

Investment risk inherent in the resource sector includes, but it is not limited to, movements in commodity price and currency which may differ materially from the assumption used in this report. Furthermore, the sector is subject to political, financial and operational risks, each of which has the potential to significantly impact company/industry performance.

Anglo American: Our price target is based on NPV.

Required Disclosures

This report has been prepared by UBS Limited, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

For information on the ways in which UBS manages conflicts and maintains independence of its research product; historical performance information; and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures. The figures contained in performance charts refer to the past; past performance is not a reliable indicator of future results. Additional information will be made available upon request. UBS Securities Co. Limited is licensed to conduct securities investment consultancy businesses by the China Securities Regulatory Commission. UBS acts or may act as principal in the debt securities (or in related derivatives) that may be the subject of this report. This recommendation was finalized on: 22 June 2018 04:56 AM GMT. UBS has designated certain Research department members as Derivatives Research Analysts where those department members publish research principally on the analysis of the price or market for a derivative, and provide information reasonably sufficient upon which to base a decision to enter into a derivatives transaction. Where Derivatives Research Analysts co-author research reports with Equity Research Analysts or Economists, the Derivatives Research Analyst is responsible for the derivatives investment views, forecasts, and/or recommendations.

Analyst Certification: Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers and were prepared in an independent manner, including with respect to UBS, and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.

UBS Investment Research: Global Equity Rating Definitions

12-Month Rating	**Definition**	**Coverage[1]**	**IB Services[2]**
Buy	FSR is > 6% above the MRA.	46%	25%
Neutral	FSR is between -6% and 6% of the MRA.	39%	23%
Sell	FSR is > 6% below the MRA.	15%	12%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 31 March 2018.
1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

KEY DEFINITIONS:Forecast Stock Return (FSR) is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months. In some cases, this yield may be based on accrued dividends. **Market Return Assumption (MRA)** is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium). **Under Review (UR)** Stocks may be flagged as UR by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation. **Short-Term Ratings** reflect the expected near-term (up to three months) performance of the stock and do not reflect any change in the fundamental view or investment case. **Equity Price Targets** have an investment horizon of 12 months.

EXCEPTIONS AND SPECIAL CASES:UK and European Investment Fund ratings and definitions are: Buy: Positive on factors such as structure, management, performance record, discount; **Neutral:** Neutral on factors such as structure, management, performance record, discount; **Sell:** Negative on factors such as structure, management, performance record, discount. **Core Banding Exceptions (CBE):** Exceptions to the standard +/-6% bands may be granted by the Investment Review Committee (IRC). Factors considered by the IRC include the stock's volatility and the credit spread of the respective company's debt. As a result, stocks deemed to be very high or low risk may be subject to higher or lower bands as they relate to the rating. When such exceptions apply, they will be identified in the Company Disclosures table in the relevant research piece.

Research analysts contributing to this report who are employed by any non-US affiliate of UBS Securities LLC are not registered/qualified as research analysts with FINRA. Such analysts may not be associated persons of UBS Securities LLC and therefore are not subject to the FINRA restrictions on communications with a subject company, public appearances, and trading securities held by a research analyst account. The name of each affiliate and analyst employed by that affiliate contributing to this report, if any, follows.

UBS Limited: Myles Allsop; Daniel Major; Hugo Bravery. **UBS Securities Australia Ltd:** Glyn Lawcock.

Company Disclosures

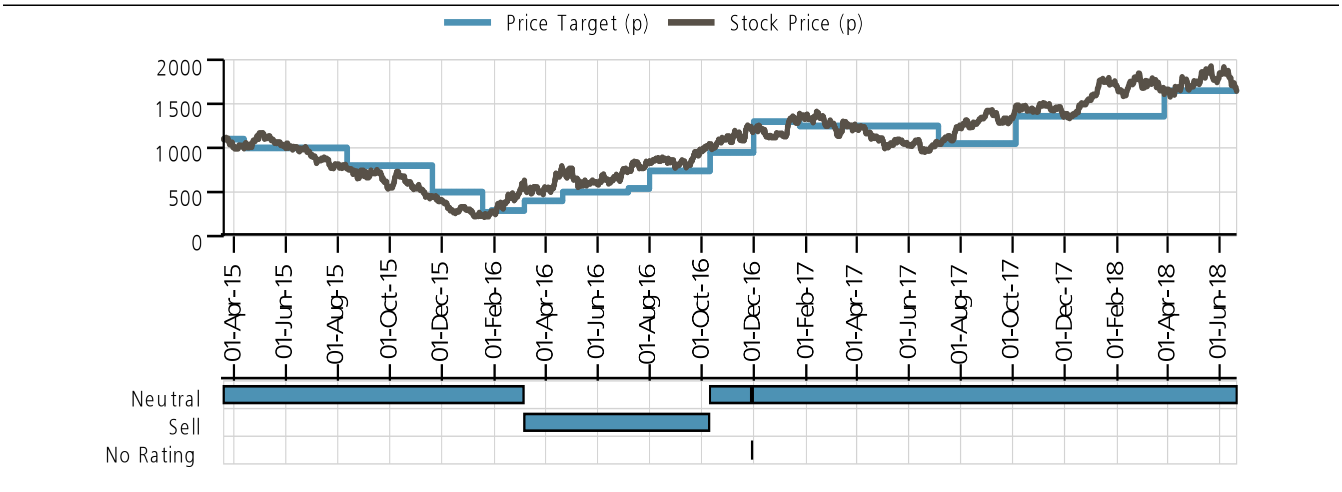
Company Name	Reuters	12-month rating	Short-term rating	Price	Price date
Anglo American[4, 5, 6, 7]	AAL.L	Neutral	N/A	1,652p	21 Jun 2018

Source: UBS. All prices as of local market close.
Ratings in this table are the most current published ratings prior to this report. They may be more recent than the stock pricing date

4. Within the past 12 months, UBS AG, its affiliates or subsidiaries has received compensation for investment banking services from this company/entity or one of its affiliates.
5. UBS AG, its affiliates or subsidiaries expect to receive or intend to seek compensation for investment banking services from this company/entity within the next three months.
6. This company/entity is, or within the past 12 months has been, a client of UBS Securities LLC, and investment banking services are being, or have been, provided.
7. Within the past 12 months, UBS Securities LLC and/or its affiliates have received compensation for products and services other than investment banking services from this company/entity.

Unless otherwise indicated, please refer to the Valuation and Risk sections within the body of this report. For a complete set of disclosure statements associated with the companies discussed in this report, including information on valuation and risk, please contact UBS Securities LLC, 1285 Avenue of Americas, New York, NY 10019, USA, Attention: Investment Research.

Anglo American (p)



Date	Stock Price (p)	Price Target (p)	Rating
2015-03-20	1101.0	1100.0	Neutral
2015-04-13	999.0	1000.0	Neutral
2015-08-12	770.0	800.0	Neutral
2015-11-20	447.0	500.0	Neutral
2016-01-18	233.0	270.0	Neutral
2016-01-28	276.0	290.0	Neutral
2016-03-07	628.0	400.0	Sell
2016-04-21	747.0	500.0	Sell
2016-07-07	747.0	540.0	Sell
2016-08-01	849.0	740.0	Sell
2016-10-11	1031.0	950.0	Neutral
2016-11-29	1205.0	-	No Rating
2016-11-30	1185.0	950.0	Neutral
2016-12-01	1208.0	1300.0	Neutral
2017-01-24	1386.0	1250.0	Neutral
2017-07-06	1056.0	1050.0	Neutral
2017-10-05	1474.0	1360.0	Neutral
2018-03-28	1617.0	1650.0	Neutral

Source: UBS; as of 21 Jun 2018

Global Disclaimer

This document has been prepared by UBS Limited, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

Global Research is provided to our clients through UBS Neo, in certain instances, UBS.com and any other system, or distribution method specifically identified in one or more communications distributed through UBS Neo or UBS.com as an approved means for distributing Global Research (each a "System"). It may also be made available through third party vendors and distributed by UBS and/or third parties via e-mail or alternative electronic means. The level and types of services provided by Global Research to a client may vary depending upon various factors such as a client's individual preferences as to the frequency and manner of receiving communications, a client's risk profile and investment focus and perspective (e.g., market wide, sector specific, long-term, short-term, etc.), the size and scope of the overall client relationship with UBS and legal and regulatory constraints.

All Global Research is available on UBS Neo. Please contact your UBS sales representative if you wish to discuss your access to UBS Neo.

When you receive Global Research through a System, your access and/or use of such Global Research is subject to this Global Research Disclaimer and to the terms of use governing the applicable System.

When you receive Global Research via a third party vendor, e-mail or other electronic means, you agree that use shall be subject to this Global Research Disclaimer, where applicable the UBS Investment Bank terms of business (https://www.ubs.com/global/en/investment-bank/regulatory.html) and to UBS's Terms of Use/Disclaimer (http://www.ubs.com/global/en/legalinfo2/disclaimer.html). In addition, you consent to UBS processing your personal data and using cookies in accordance with our Privacy Statement (http://www.ubs.com/global/en/legalinfo2/privacy.html) and cookie notice (http://www.ubs.com/global/en/homepage/cookies/cookie-management.html).

If you receive Global Research, whether through a System or by any other means, you agree that you shall not copy, revise, amend, create a derivative work, provide to any third party, or in any way commercially exploit any UBS research provided via Global Research or otherwise, and that you shall not extract data from any research or estimates provided to you via Global Research or otherwise, without the prior written consent of UBS.

This document is for distribution only as may be permitted by law. It is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or would subject UBS to any registration or licensing requirement within such jurisdiction.

This document is a general communication and is educational in nature; it is not an advertisement nor is it a solicitation or an offer to buy or sell any financial instruments or to participate in any particular trading strategy. Nothing in this document constitutes a representation that any investment strategy or recommendation is suitable or appropriate to an investor's individual circumstances or otherwise constitutes a personal recommendation. By providing this document, none of UBS or its representatives has any responsibility or authority to provide or have provided investment advice in a fiduciary capacity or otherwise. Investments involve risks, and investors should exercise prudence and their own judgment in making their investment decisions. None of UBS or its representatives is suggesting that the recipient or any other person take a specific course of action or any action at all. By receiving this document, the recipient acknowledges and agrees with the intended purpose described above and further disclaims any expectation or belief that the information constitutes investment advice to the recipient or otherwise purports to meet the investment objectives of the recipient. The financial instruments described in the document may not be eligible for sale in all jurisdictions or to certain categories of investors.

Options, structured derivative products and futures (including OTC derivatives) are not suitable for all investors. Trading in these instruments is considered risky and may be appropriate only for sophisticated investors. Prior to buying or selling an option, and for the complete risks relating to options, you must receive a copy of "The Characteristics and Risks of Standardized Options." You may read the document at http://www.theocc.com/publications/risks/riskchap1.jsp or ask your salesperson for a copy. Various theoretical explanations of the risks associated with these instruments have been published. Supporting documentation for any claims, comparisons, recommendations, statistics or other technical data will be supplied upon request. Past performance is not necessarily indicative of future results. Transaction costs may be significant in option strategies calling for multiple purchases and sales of options, such as spreads and straddles. Because of the importance of tax considerations to many options transactions, the investor considering options should consult with his/her tax advisor as to how taxes affect the outcome of contemplated options transactions.

Mortgage and asset-backed securities may involve a high degree of risk and may be highly volatile in response to fluctuations in interest rates or other market conditions. Foreign currency rates of exchange may adversely affect the value, price or income of any security or related instrument referred to in the document. For investment advice, trade execution or other enquiries, clients should contact their local sales representative.

The value of any investment or income may go down as well as up, and investors may not get back the full (or any) amount invested. Past performance is not necessarily a guide to future performance. Neither UBS nor any of its directors, employees or agents accepts any liability for any loss (including investment loss) or damage arising out of the use of all or any of the Information.

Prior to making any investment or financial decisions, any recipient of this document or the information should seek individualized advice from his or her personal financial, legal, tax and other professional advisors that takes into account all the particular facts and circumstances of his or her investment objectives.

Any prices stated in this document are for information purposes only and do not represent valuations for individual securities or other financial instruments. There is no representation that any transaction can or could have been effected at those prices, and any prices do not necessarily reflect UBS's internal books and records or theoretical model-based valuations and may be based on certain assumptions. Different assumptions by UBS or any other source may yield substantially different results.

No representation or warranty, either expressed or implied, is provided in relation to the accuracy, completeness or reliability of the information contained in any materials to which this document relates (the "Information"), except with respect to Information concerning UBS. The Information is not intended to be a complete statement or summary of the securities, markets or developments referred to in the document. UBS does not undertake to update or keep current the Information. Any opinions expressed in this document may change without notice and may differ or be contrary to opinions expressed by other business areas or groups, personnel or other representative of UBS. Any statements contained in this report attributed to a third party represent UBS's interpretation of the data, information and/or opinions provided by that third party either publicly or through a subscription service, and such use and interpretation have not been reviewed by the third party. In no circumstances may this document or any of the Information (including any forecast, value, index or other calculated amount ("Values")) be used for any of the following purposes:

(i) valuation or accounting purposes;

(ii) to determine the amounts due or payable, the price or the value of any financial instrument or financial contract; or

(iii) to measure the performance of any financial instrument including, without limitation, for the purpose of tracking the return or performance of any Value or of defining the asset allocation of portfolio or of computing performance fees.

By receiving this document and the Information you will be deemed to represent and warrant to UBS that you will not use this document or any of the Information for any of the above purposes or otherwise rely upon this document or any of the Information.

UBS has policies and procedures, which include, without limitation, independence policies and permanent information barriers, that are intended, and upon which UBS relies, to manage potential conflicts of interest and control the flow of information within divisions of UBS and among its subsidiaries, branches and affiliates. For further information on the ways in which UBS manages conflicts and maintains independence of its research products, historical performance information and certain additional disclosures concerning UBS research recommendations, please visit www.ubs.com/disclosures.

Research will initiate, update and cease coverage solely at the discretion of UBS Research Management, which will also have sole discretion on the timing and frequency of any published research product. The analysis contained in this document is based on numerous assumptions. All material information in relation to published research reports, such as valuation methodology, risk statements, underlying assumptions (including sensitivity analysis of those assumptions), ratings history etc. as required by the Market Abuse Regulation, can be found on UBS Neo. Different assumptions could result in materially different results.

The analyst(s) responsible for the preparation of this document may interact with trading desk personnel, sales personnel and other parties for the purpose of gathering, applying and interpreting market information. UBS relies on information barriers to control the flow of information contained in one or more areas within UBS into other areas, units, groups or affiliates of UBS. The compensation of the analyst who prepared this document is determined exclusively by research management and senior management (not including investment banking). Analyst compensation is not based on investment banking revenues; however, compensation may relate to the revenues of UBS and/or its divisions as a whole, of which investment banking, sales and trading are a part, and UBS's subsidiaries, branches and affiliates as a whole.

For financial instruments admitted to trading on an EU regulated market: UBS AG, its affiliates or subsidiaries (excluding UBS Securities LLC) acts as a market maker or liquidity provider (in accordance with the interpretation of these terms in the UK) in the financial instruments of the issuer save that where the activity of liquidity provider is carried out in accordance with the definition given to it by the laws and regulations of any other EU jurisdictions, such information is separately disclosed in this document. For financial instruments admitted to trading on a non-EU regulated market: UBS may act as a market maker save that where this activity is carried out in the US in accordance with the definition given to it by the relevant laws and regulations, such activity will be specifically disclosed in this document. UBS may have issued a warrant the value of which is based on one or more of the financial instruments referred to in the document. UBS and its affiliates and employees may have long or short positions, trade as principal and buy and sell in instruments or derivatives identified herein; such transactions or positions may be inconsistent with the opinions expressed in this document.

Within the past 12 months UBS AG, its affiliates or subsidiaries may have received or provided investment services and activities or ancillary services as per MiFID II which may have given rise to a payment or promise of a payment in relation to these services from or to this company.

United Kingdom and the rest of Europe: Except as otherwise specified herein, this material is distributed by UBS Limited to persons who are eligible counterparties or professional clients. UBS Limited is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. **France:** Prepared by UBS Limited and distributed by UBS Limited and UBS Securities France S.A. UBS Securities France S.A. is regulated by the ACPR (Autorité de Contrôle Prudentiel et de Résolution) and the Autorité des Marchés Financiers (AMF). Where an analyst of UBS Securities France S.A. has contributed to this document, the document is also deemed to have been prepared by UBS Securities France S.A. **Germany:** Prepared by UBS Limited and distributed by UBS Limited and UBS Europe SE. UBS Europe SE is regulated by the Bundesanstalt fur Finanzdienstleistungsaufsicht (BaFin). **Spain:** Prepared by UBS Limited and distributed by UBS Limited and UBS Securities España SV, SA. UBS Securities España SV, SA is regulated by the Comisión Nacional del Mercado de Valores (CNMV). **Turkey:** Distributed by UBS Limited. No information in this document is provided for the purpose of offering, marketing and sale by any means of any capital market instruments and services in the Republic of Turkey. Therefore, this document may not be considered as an offer made or to be made to residents of the Republic of Turkey. UBS Limited is not licensed by the Turkish Capital Market Board under the provisions of the Capital Market Law (Law No. 6362). Accordingly, neither this document nor any other offering material related to the instruments/services may be utilized in connection with providing any capital market services to persons within the Republic of Turkey without the prior approval of the Capital Market Board. However, according to article 15 (d) (ii) of the Decree No. 32, there is no restriction on the purchase or sale of the securities abroad by residents of the Republic of Turkey. **Poland:** Distributed by UBS Limited (spolka z ograniczona odpowiedzialnoscia) Oddzial w Polsce regulated by the Polish Financial Supervision Authority. Where an analyst of UBS Limited (spolka z ograniczona odpowiedzialnoscia) Oddzial w Polsce has contributed to this document, the document is also deemed to have been prepared by UBS Limited (spolka z ograniczona odpowiedzialnoscia) Oddzial w Polsce. **Russia:** Prepared and distributed by UBS Bank (OOO). **Switzerland:** Distributed by UBS AG to persons who are institutional investors only. UBS AG is regulated by the Swiss Financial Market Supervisory Authority (FINMA). **Italy:** Prepared by UBS Limited and distributed by UBS Limited and UBS Limited, Italy Branch. Where an analyst of UBS Limited, Italy Branch has contributed to this document, the document is also deemed to have been prepared by UBS Limited, Italy Branch. **South Africa:** Distributed by UBS South Africa (Pty) Limited (Registration No. 1995/011140/07), an authorised user of the JSE and an authorised Financial Services Provider (FSP 7328). **Israel:** This material is distributed by UBS Limited. UBS Limited is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. UBS Securities Israel Ltd is a licensed Investment Marketer that is supervised by the Israel Securities Authority (ISA). UBS Limited and its affiliates incorporated outside Israel are not licensed under the Israeli Advisory Law. UBS Limited is not covered by insurance as required from a licensee under the Israeli Advisory Law. UBS may engage among others in issuance of Financial Assets or in distribution of Financial Assets of other issuers for fees or other benefits. UBS Limited and its affiliates may prefer various Financial Assets to which they have or may have Affiliation (as such term is defined under the Israeli Advisory Law). Nothing in this Material should be considered as investment advice under the Israeli Advisory Law. This Material is being issued only to and/or is directed only at persons who are Eligible Clients within the meaning of the Israeli Advisory Law, and this material must not be relied on or acted upon by any other persons. **Saudi Arabia:** This document has been issued by UBS AG (and/or any of its subsidiaries, branches or affiliates), a public company limited by shares, incorporated in Switzerland with its registered offices at Aeschenvorstadt 1, CH-4051 Basel and Bahnhofstrasse 45, CH-8001 Zurich. This publication has been approved by UBS Saudi Arabia (a subsidiary of UBS AG), a Saudi closed joint stock company incorporated in the Kingdom of Saudi Arabia under commercial register number 1010257812 having its registered office at Tatweer Towers, P.O. Box 75724, Riyadh 11588, Kingdom of Saudi Arabia. UBS Saudi Arabia is authorized and regulated by the Capital Market Authority to conduct securities business under license number 08113-37. **UAE / Dubai:** The information distributed by UBS AG Dubai Branch is only intended for Professional Clients and/or Market Counterparties, as classified under the DFSA rulebook. No other person should act upon this material/communication. The information is not for further distribution within the United Arab Emirates. UBS AG Dubai Branch is regulated by the DFSA in the DIFC. UBS is not licensed to provide banking services in the UAE by the Central Bank of the UAE, nor is it licensed by the UAE Securities and Commodities Authority. **United States:** Distributed to US persons by either UBS Securities LLC or by UBS Financial Services Inc., subsidiaries of UBS AG; or by a group, subsidiary or affiliate of UBS AG that is not registered as a US broker-dealer (a **'non-US affiliate'**) to major US institutional investors only. UBS Securities LLC or UBS Financial Services Inc. accepts responsibility for the content of a document prepared by another non-US affiliate when distributed to US persons by UBS Securities LLC or UBS Financial Services Inc. All transactions by a US person in the securities mentioned in this document must be effected through UBS Securities LLC or UBS Financial Services Inc., and not through a non-US affiliate. UBS Securities LLC is not acting as a municipal advisor to any municipal entity or obligated person within the meaning of Section 15B of the Securities Exchange Act (the "Municipal Advisor Rule"), and the opinions or views contained herein are not intended to be, and do not constitute, advice within the meaning of the Municipal Advisor Rule. **Canada:** Distributed by UBS Securities Canada Inc., a registered investment dealer in Canada and a Member-Canadian Investor Protection Fund, or by another affiliate of UBS AG that is registered to conduct business in Canada or is otherwise exempt from registration. **Mexico:** This report has been distributed and prepared by UBS Casa de Bolsa, S.A. de C.V., UBS Grupo Financiero, an entity that is part of UBS Grupo Financiero, S.A. de C.V. and is a subsidiary of UBS AG. This document is intended for distribution to institutional or sophisticated investors only. Research reports only reflect the views of the analysts responsible for the reports. Analysts do not receive any compensation from persons or entities different from UBS Casa de Bolsa, S.A. de C.V., UBS Grupo Financiero, or different from entities belonging to the same financial group or business group of such. For Spanish translations of applicable disclosures, please go to www.ubs.com/disclosures. **Brazil:** Except as otherwise specified herein, this material is prepared by UBS Brasil CCTVM S.A. to persons who are eligible investors residing in Brazil, which are considered to be: (i) financial institutions, (ii) insurance firms and investment capital companies, (iii) supplementary pension entities, (iv) entities that hold financial investments higher than R$300,000.00 and that confirm the status of qualified investors in written, (v) investment funds, (vi) securities portfolio managers and securities consultants duly authorized by Comissão de Valores Mobiliários (CVM), regarding their own investments, and (vii) social security systems created by the Federal Government, States, and Municipalities. **Hong Kong:** Distributed by UBS Securities Asia Limited and/or UBS AG, Hong Kong Branch. Please contact local licensed/registered representatives of UBS Securities Asia Limited and/or UBS AG, Hong Kong Branch in respect of any matters arising from, or in connection with, the analysis or document. **Singapore:** Distributed by UBS Securities Pte. Ltd. [MCI (P) 008/09/2017 and Co. Reg. No.: 198500648C] or UBS AG, Singapore Branch. Please contact UBS Securities Pte. Ltd., an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110); or UBS AG, Singapore Branch, an exempt financial adviser under the Singapore Financial Advisers Act (Cap. 110) and a wholesale bank licensed under the Singapore Banking Act (Cap. 19) regulated by the Monetary Authority of Singapore, in respect of any matters arising from, or in connection with, the analysis or document. The recipients of this document represent and warrant that they are accredited and institutional investors as defined in the Securities and Futures Act (Cap. 289). **Japan:** Distributed by UBS Securities Japan Co., Ltd. to professional investors (except as otherwise permitted). Where this document has been prepared by UBS Securities Japan Co., Ltd., UBS Securities Japan Co., Ltd. is the author, publisher and distributor of the document. Distributed by UBS AG, Tokyo Branch to Professional Investors (except as otherwise permitted) in relation to foreign exchange and other banking businesses when relevant. **Australia:** Clients of UBS AG: Distributed by UBS AG (ABN 47 088 129 613 and holder of Australian Financial Services License No. 231087). Clients of UBS Securities Australia Ltd: Distributed by UBS Securities Australia Ltd (ABN 62 008 586 481 and holder of Australian Financial Services License No. 231098). This Document contains general information and/or general advice only and does not constitute personal financial product advice. As such, the Information in this document has been prepared without taking into account any investor's objectives, financial situation or needs, and investors should, before acting on the Information, consider the appropriateness of the Information, having regard to their objectives, financial situation and needs. If the Information contained in this document relates to the acquisition, or potential acquisition of a particular financial product by a 'Retail' client as defined by section 761G of the Corporations Act 2001 where a Product Disclosure Statement would be required, the retail client should obtain and consider the Product Disclosure Statement relating to the product before making any decision about whether to acquire the product. The UBS Securities Australia Limited Financial Services Guide is available at: www.ubs.com/ecs-research-fsg. **New Zealand:** Distributed by UBS New Zealand Ltd. UBS New Zealand Ltd is not a registered bank in New Zealand. You are being provided with this UBS publication or material because you have indicated to UBS that you are a "wholesale client" within the meaning of section 5C of the Financial Advisers Act 2008 of New Zealand (Permitted Client). This publication or material is not intended for clients who are not Permitted Clients (non-permitted Clients). If you are a non-permitted Client you must not rely on this publication or material. If despite this warning you nevertheless rely on this publication or material, you hereby (i) acknowledge that you may not rely on the content of this publication or material and that any recommendations or opinions in such this publication or material are not made or provided to you, and (ii) to the maximum extent permitted by law (a) indemnify UBS and its associates or related entities (and their respective Directors, officers, agents and Advisors) (each a 'Relevant Person') for any loss, damage, liability or claim any of them may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material and (b) waive any rights or remedies you may have against any Relevant Person for (or in respect of) any loss, damage, liability or claim you may incur or suffer as a result of, or in connection with, your unauthorised reliance on this publication or material. **Korea:** Distributed in Korea by UBS Securities Pte. Ltd., Seoul Branch. This document may have been edited or contributed to from time to time by affiliates of UBS Securities Pte. Ltd., Seoul Branch. This material is intended for professional/institutional clients only and not for distribution to any retail clients. **Malaysia:** This

UBS