Balance Sheet – Some long-term issues

US Economics

Lewis Alexander
US Chief Economist
+1-212-667-9665
Lewis.Alexander@nomura.com

November 2017
Agenda

- Effectiveness of QE and the portfolio channel
- The criteria for determining the ultimate size of the balance sheet:
  - Efficiency and effectiveness of monetary policy
  - Systemic risk

“The problem with QE is that it works in practice, but it doesn’t work in theory.”

Ben Bernanke, January 16, 2014.

• This is a problem.
Gagnon (2016) reports results from a range of empirical studies of the impact of asset purchases on long-term interest rates:

- 18 event studies
- 6 time series
- 3 structural models.

The estimates are broadly consistent and suggest that such asset purchases are effective.
Why does QE work?

- That standard view is that QE works through two channels
  - Signaling – forward guidance
  - Portfolio balance – supply of duration.

- There is more confidence in the signaling channel
  - It is closer to conventional understanding of how policy works.

- Skepticism about the portfolio balance/supply channel persists
  - Standard models, with representative agents, do not tend produce supply effects.

- This matters
  - The FOMC may not think about implications of its balance decisions
  - Doubts may make the FOMC reluctant to use QE in the future
Modeling of the impact of supply

- Event studies
  - They are a useful as a way of identifying factors that are impactful
  - But full adjustment does not happen so fast.

- We need structural models.

- Not all investors are the same
  - To anyone involved in markets this basic fact seems obvious
  - Preferred habitat is a natural way to think about the impact of supply.

- One good approach -- affine models with different types of investors
  - Li-Wei model
  - Duration is what matters.

Source: Li and Wei (2014), Nomura Economics
During and directly after WWII the Federal Reserve successfully controlled long-term interest rates, but this episode had essentially no impact on Federal Reserve thinking about monetary policy.

- Operation twist was a Treasury initiative which the Federal Reserve later disowned.

Standard thinking was that all the Federal Reserve had to do was control short-term interest rates and possibly use forward guidance.

- This reflected high neutral rates
- But it also reflected the theoretical judgment that the composition of the Fed’s assets simply did not matter.

The composition of the Federal Reserve’s assets was dictated by other objectives.

- Facilitating interest rate control through the rapid and smooth adjustment of reserves
- Promoting the efficiency of the Treasury market.

A practical problem

- When its time for the Federal Reserve’s balance sheet to expand again, what type of assets will it buy?
  - Treasury bills
  - Across the curve.

- If the portfolio/supply channel is important this question matters

Source: Nomura Economics
Fed balance sheet “normalization”

Alternative scenarios for the Federal Reserve’s balance sheet

$US, bil.

Source: Federal Reserve, Nomura Economics
Fed balance sheet “normalization”: 
*Alternative endpoints*

**SOMA: Alternative projections for liabilities**

<table>
<thead>
<tr>
<th>Percent of GDP</th>
<th>Actual values</th>
<th>Nomura projections: Alternative endpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves + domestic RRP</td>
<td>Jun 2007</td>
<td>Jun 2017</td>
</tr>
<tr>
<td>Treasury deposits + foreign RRP</td>
<td>Jun 2020</td>
<td>Large</td>
</tr>
<tr>
<td>Currency</td>
<td>Jun 2023</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Jun 2023</td>
<td></td>
</tr>
</tbody>
</table>

**SOMA: Alternative projections for assets**

<table>
<thead>
<tr>
<th>Percent of GDP</th>
<th>Actual values</th>
<th>Nomura projections: Alternative endpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBS</td>
<td>Jun 2007</td>
<td>Jun 2017</td>
</tr>
<tr>
<td>Notes and bonds</td>
<td>Jun 2020</td>
<td>Large</td>
</tr>
<tr>
<td>Bills</td>
<td>Jun 2023</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Jun 2023</td>
<td></td>
</tr>
</tbody>
</table>

Source: Federal Reserve, Nomura Economics
The duration of the Federal Reserve’s assets has been declining since late 2014.

From 1951 to 2007, roughly 40% of Federal Reserve assets were Treasury bills. Now it has only long-term securities.

When the nominal size of the Fed’s portfolio stops falling it will still have a substantial amount of duration.
Fed balance sheet “normalization”: Impact on Treasury term premia

Model estimates how balance sheet normalization will affect 10yr term premia


Source: Federal Reserve and Nomura Economics
Another practical problem

- **Should the FOMC care about the slope of the yield curve?**
- **A flatter curve means:**
  - More room to cut short-term interest rates
  - Less incentive for private maturity transformation.

Source: Nomura Economics
“The Committee also anticipates that … the Federal Reserve’s securities holdings will continue to decline in a gradual and predictable manner until … the Federal Reserve is holding no more securities than necessary to implement monetary policy efficiently and effectively.”

FOMC, statement on Policy Normalization Principles and Plans, June 13, 2017

• What sort of standard does this set?
“Efficient and effective” policy implementation

1. FOMC Target
2. Specific Short-term interest rate
3. Other Short-term interest rates
4. Financial Conditions
5. Economic activity

Does controlling short-term interest rates today require a large balance sheet?

- New sources of variance in the supply and demand for reserves will make controlling interest rates through scarcity a bigger challenge.
- Do modest deviations of the short-term interest rates from the FOMC’s target undermine the effectiveness of policy?
  - How much variance can the system tolerate?
  - Before 1994, when the FOMC did not reveal its target, this was a different problem.

Source: Potter (2017), Logan (2017), Federal Reserve, and Nomura Economics
Controlling short-term interest rates through scarcity

Deviation of Fed funds effective from the FOMC target

Source: Federal Reserve and Nomura Economics
Since the GFC the super-abundance of reserves and new regulations have affected the nexus of short-term interest rates.

For example, the leverage ratio limits the degree to which the Federal Reserve’s IOR rate anchors other short-term interest rates.

Since 2013 the Federal Reserve has given a range of non-bank financial institutions access to its balance sheet through its reverse repurchase (RRP) program, earning the RRP rate.

Source: Duffie and Krishnamurthy (2016); Klee, Senyuz, and Yoldas (2016); and Potter (2017), Bloomberg, Haver, Federal Reserve, and Nomura Economics.
Federal Reserve balance sheet and systemic risk

- Displacing private maturity transformation
- Maintaining a “big footprint” in money markets
- Rolling back regulation
- The roll of the Treasury

Source: Nomura Economics
Complex nature of cash and funding markets

- Short-term money and funding markets are complex.
- Funding flows and the related credit and counterparty relationships occur in a complex network involving many diverse institutions.
- The figure to the right—taken from Aguiar, et al (2014)—shows funding flows coming into and out of a typical Bank/Dealer. For the flows of secured funding, it also shows the path of collateral and securities in the opposite direction.
- As short-term funding from key sources such as money market funds, pension funds and corporate treasurers move through the system, with Bank/Dealers playing a central role, risk is transformed and reallocated.
- How the Federal Reserve interacts with this system—by providing reserves to banks, RRP transactions with other institutions, and through its securities transactions—affects how this system operates and its stability.

Historically, the Federal Reserve has held a substantial amount of short-term securities.

The Federal Reserve has not tried to use the composition of its assets as an instrument of monetary policy

- This changed in the wake of the GFC.

Selling short-term assets and buying long-term assets lengthened the average maturity of the assets on its balance sheet.

*Note: Short-term securities include Treasury bills, Treasury certificates, and bankers’ acceptances.

Source: Meulendyke (1998), Federal Reserve, and Nomura Economics
Banks have benefited from the Fed’s provision of reserves.
Banks will probably not absorb all the new Treasury and MBS supply as reserves fall.

- Banks have benefited from the increased supply of Fed reserves. It has made it easier for them to meet increase requirements to hold high quality liquid assets.
- As the Fed’s portfolio shrinks, banks could offset the decline in reserves by holding more Treasuries and agency MBS.
- But offsetting declines in reserves one-for-one with additional Treasuries and Agency MBS would require banks to take on more risk and it would push banks’ holdings of securities to historically high levels.
  - Additional supply will probably be absorbed outside of the banking system.
  - Note that this will imply a shift in short-term funding away from banks as well.
- Whether or not the additional supply of Treasuries and MBS are absorbed inside or outside of the banking system, higher expected returns on these assets – reflected in term premia and MBS spreads – will probably be needed.

Source: Federal Reserve, Nomura Economics
Policy expectations and term premia

Through the “taper tantrum” term premia and policy expectations moved together

10yr term premia and expectations for short-term interest rates

Source: Bloomberg, Federal Reserve, Nomura Economics.
• In the last decade there was a substantial increase in Treasury debt outstanding.
  - The Federal Reserve has absorbed only a portion of the increase in the supply of Treasury duration
  - So why are term premia substantially lower than they were 10 years ago?
• There are three obvious additional sources of demand
  - Foreign official holders of Treasuries increased their holdings by about $3 trillion over the last decade.
  - As a consequence of the global financial crisis in 2007-09, and the subsequent euro-area crisis, there has been deterioration in the perceived quality of a range of assets that formerly were considered “safe”.
  - Other major central banks are engaged in their own “QE” programs.
• None of this suggests that the “normalization” of the Fed’s balance sheet will not push term premia higher.
Inversely correlated relationship between US Treasuries and equity prices contributed to low term premia.

Treasuries are attractive now, in part, because they can be a hedge for equities.

Fed balance sheet “normalization”: Equities’ impact on Treasury term premia

Rolling 2-year correlation between daily changes in the S&P500 and 10-year Treasury bond prices

Source: Bloomberg and Nomura Economics


Analyst Certification

I, Lewis Alexander, hereby certify (1) that the views expressed in this Research report accurately reflect my personal views about any or all of the subject securities or issuers referred to in this Research report, (2) no part of my compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this Research report and (3) no part of my compensation is tied to any specific investment banking transactions performed by Nomura Securities International, Inc., Nomura International plc or any other Nomura Group company.

Important Disclosures

Online availability of research and conflict-of-interest disclosures
Nomura Group research is available on www.nomuranow.com/research, Bloomberg, Capital IQ, Factset, MarkitHub, Reuters and ThomsonOne. Important disclosures may be read at http://go.nomuranow.com/research/globalresearchportal/pages/disclosures/disclosures.aspx or requested from Nomura Securities International, Inc., or Instinet, LLC on 1-877-865-5752. If you have any difficulties with the website, please email grpsupport@nomura.com for help.

The analysts responsible for preparing this report have received compensation based upon various factors including the firm’s total revenues, a portion of which is generated by Investment Banking activities. Unless otherwise noted, the non-US analysts listed at the front of this report are not registered/qualified as research analysts under FINRA rules, may not be associated persons of NSI or ILLC, and may not be subject to FINRA Rule 2241 restrictions on communications with covered companies, public appearances, and trading securities held by a research analyst account.

Nomura Global Financial Products Inc. ("NGFP") Nomura Derivative Products Inc. ("NDPI") and Nomura International plc. ("NIplc") are registered with the Commodities Futures Trading Commission and the National Futures Association (NFA) as swap dealers. NGFP, NDPI, and NIplc are generally engaged in the trading of swaps and other derivative products, any of which may be the subject of this report.

ADDITIONAL DISCLOSURES REQUIRED IN THE U.S.

Principal Trading: Nomura Securities International, Inc and its affiliates will usually trade as principal in the fixed income securities (or in related derivatives) that are the subject of this research report. Analyst Interactions with other Nomura Securities International, Inc. Personnel: The fixed income research analysts of Nomura Securities International, Inc and its affiliates regularly interact with sales and trading desk personnel in connection with obtaining liquidity and pricing information for their respective coverage universe.

Valuation methodology - Fixed Income

Nomura’s Fixed Income Strategists express views on the price of securities and financial markets by providing trade recommendations. These can be relative value recommendations, directional trade recommendations, asset allocation recommendations, or a mixture of all three.

The analysis which is embedded in a trade recommendation would include, but not be limited to:

• Fundamental analysis regarding whether a security’s price deviates from its underlying macro- or micro-economic fundamentals.
• Quantitative analysis of price variations.
• Technical factors such as regulatory changes, changes to risk appetite in the market, unexpected rating actions, primary market activity and supply/ demand considerations.

The timeframe for a trade recommendation is variable. Tactical ideas have a short timeframe, typically less than three months. Strategic trade ideas have a longer timeframe of typically more than three months.

For the purposes of the EU Market Abuse Regulation, the distribution of ratings published by Nomura Global Fixed Income Research is as follows:

54% have been assigned a Buy (or equivalent) rating; 94% of issuers with this rating were supplied material services* by the Nomura Group**.

0% have been assigned a Neutral (or equivalent) rating.
As at 3 Oct 2017.
*As defined by the EU Market Abuse Regulation
**The Nomura Group as defined in the Disclaimer section at the end of this report

Disclaimers
This publication contains material that has been prepared by the Nomura Group entity identified on page 1 and, if applicable, with the contributions of one or more Nomura Group entities whose employees and their respective affiliations are specified on page 1 or identified elsewhere in the publication. The term "Nomura Group" used herein refers to Nomura Holdings, Inc. and its affiliates and subsidiaries including: Nomura Securities Co., Ltd. ("NSC") Tokyo, Japan; Nomura International plc ("NIplc"), UK; Nomura Securities International, Inc. ("NSI"), New York, US; Instinet, LLC ("ILLC"); Nomura International (Hong Kong) Ltd. ("NIHK"); Hong Kong; Nomura Financial Investment (Korea) Co., Ltd. ("NFIIK"), Korea (Information on analysts registered with the Korea Financial Investment Association ("KOFIA") can be found on the KOFIA Intranet at http://dis.kofia.or.kr); Nomura Singapore Ltd. ("NSL"), Singapore (Registration number 197201440E, regulated by the Monetary Authority of Singapore); Nomura Australia Ltd. ("NAL"), Australia (ABN 48 003 032 513), regulated by the Australian Securities and Investment Commission ('ASIC') and holder of an Australian financial services licence number 246412; PT Nomura Sekuritas Indonesia ("PTNSI"); Nomura Securities Malaysia Sdn. Bhd. ("NSM"), Malaysia; NIIHK, Taipei Branch ("NITB"), Taiwan; Nomura Financial Advisory and Securities (India) Private Limited ("NFASL"), Mumbai, India (Registered Address: Ceejay House, Level 11, Plot F, Shivsagar Estate, Dr. Annie Besant Road, Worli, Mumbai- 400 018, India; Tel: +91 22 4037 4037, Fax: +91 22 4037 4111; CIN No: U74140MH2007PTC169116; SEBI Registration No. for Stock Broking activities: INB011299030, NSE INB231299034, INF231299034, INE 231299034, MCX: INE261299034; SEBI Registration No. for Merchant Banking: INM000011419; SEBI Registration No. for Research: INH000001014 and NIplc, Madrid Branch ("NIplc, Madrid"), ‘CNS Thailand’ next to an analyst’s name on the front page of a research report indicates that the analyst is employed by Capital Markets Securities Public Company Limited (‘CNS’) to provide research assistance services to NSL under an agreement between CNS and NSL. ‘NSFSPL’ next to an employee’s name on the front page of a research report indicates that the individual is employed by Nomura Structured Finance Services Private Limited to provide assistance to certain Nomura entities under inter-company agreements. The "BDO-NS" (which stands for "BDO Nomura Securities, Inc.") placed next to an analyst’s name on the front page of a research report indicates that the analyst is employed by BDO Unibank Inc. ("BDO Unibank") who has been seconded to BDO-NS, to provide research assistance services to NSL under an agreement between BDO Unibank, NSL and BDO-NS. BDO-NS is a Philippines securities dealer, which is a joint venture between BDO Unibank and the Nomura Group.

THIS MATERIAL IS: (I) FOR YOUR PRIVATE INFORMATION, AND WE ARE NOT SOLICITING ANY ACTION BASED UPON IT; (II) NOT TO BE CONSTRUED AS AN OFFER TO SELL OR A SOLICITATION OF AN OFFER TO BUY ANY SECURITY IN ANY JURISDICTION WHERE SUCH OFFER OR SOLICITATION WOULD BE ILLEGAL; AND (III) OTHER THAN DISCLOSURES RELATING TO THE NOMURA GROUP, BASED UPON INFORMATION FROM SOURCES THAT WE CONSIDER RELIABLE, BUT HAS NOT BEEN INDEPENDENTLY VERIFIED BY NOMURA GROUP.

As other than disclosures relating to the Nomura Group, the Nomura Group does not warrant or represent that the document is accurate, complete, reliable, fit for any particular purpose or merchantable and does not accept liability for any act (or decision not to act) resulting from use of this document and related data. To the maximum extent permissible all warranties and other assurances as the Nomura Group are hereby excluded and the Nomura Group shall have no liability for the use, misuse, or distribution of this information.

Opinions or estimates expressed are current opinions as of the original publication date appearing on this material and the information, including the opinions and estimates contained herein, are subject to change without notice. The Nomura Group is under no duty to update this document. Any comments or statements made herein are those of the author(s) and may differ from views held by other parties within Nomura Group. Clients should consider whether any advice or recommendation in this report is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The Nomura Group does not provide tax advice.

This publication may contain information obtained from third parties, including ratings from credit ratings agencies such as Standard & Poor's. Reproduction and distribution of third-party content in any form is prohibited except with the prior written permission of the related third-party. Third-party content providers do not guarantee the accuracy, completeness, timeliness or availability of any information, including ratings, and are not responsible for any errors or omissions (negligent or otherwise), regardless of the cause, or for the results obtained from the use of such content. Third-party content providers give no express or implied warranties, including, but not limited to, any warranties of merchantability or fitness for a particular purpose or use. Third-party content providers shall not be liable for any direct, indirect, incidental, exemplary, compensatory, punitive or consequential damages, costs, expenses, legal fees, or losses (including lost income or profits and opportunity costs) in connection with any use of their content, including ratings. Credit ratings are statements of opinions and are not statements.
of fact or recommendations to purchase hold or sell securities. They do not address the suitability of securities or the suitability of securities for investment purposes, and should not be relied on as investment advice.

Any MSCI sourced information in this document is the exclusive property of MSCI Inc. (‘MSCI’). Without prior written permission of MSCI, this information and any other MSCI intellectual property may not be reproduced, re-distributed or used to create any financial products, including any indices. This information is provided on an "as is" basis. The user assumes the entire risk of any use made of this information. MSCI, its affiliates and any third party involved in, or related to, computing or compiling the information hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of this information. Without limiting any of the foregoing, in no event shall MSCI, any of its affiliates or any third party involved in, or related to, computing or compiling the information have any liability for any damages of any kind. MSCI and the MSCI indexes are services marks of MSCI and its affiliates.

The intellectual property rights and any other rights, in Russell/Nomura Japan Equity Index belong to Nomura Securities Co., Ltd. ("Nomura") and Frank Russell Company ("Russell"). Nomura and Russell do not guarantee accuracy, completeness, reliability, usefulness, marketability, merchantability or fitness of the Index, and do not account for business activities or services that any index user and/or its affiliates undertakes with the use of the Index.

Investors should consider this document as only a single factor in making their investment decision and, as such, the report should not be viewed as identifying or suggesting all risks, direct or indirect, that may be associated with any investment decision. Nomura Group produces a number of different types of research product including, among others, fundamental analysis and quantitative analysis; recommendations contained in one type of research product may differ from recommendations contained in other types of research product, whether as a result of differing time horizons, methodologies or otherwise. The Nomura Group publishes research product in a number of different ways including the posting of product on the Nomura Group portals and/or distribution directly to clients. Different groups of clients may receive different products and services from the research department depending on their individual requirements.

Figures presented herein may refer to past performance or simulations based on past performance which are not reliable indicators of future performance. Moreover, simulations are based on models and simplifying assumptions which may oversimplify and not reflect the future distribution of returns. Certain securities are subject to fluctuations in exchange rates that could have an adverse effect on the value or price of, or income derived from, the investment.

With respect to Fixed Income Research: Recommendations fall into two categories: tactical, which typically last up to three months; or strategic, which typically last from 6-12 months. However, trade recommendations may be reviewed at any time as circumstances change. ‘Stop loss’ levels for trades are also provided; which, if hit, closes the trade recommendation automatically. Prices and yields shown in recommendations are taken at the time of submission for publication and are based on either indicative Bloomberg, Reuters or Nomura prices and yields at that time. The prices and yields shown are not necessarily those at which the trade recommendation can be implemented.

The securities described herein may not have been registered under the US Securities Act of 1933 (the ‘1933 Act’), and, in such case, may not be offered or sold in the US or to US persons unless they have been registered under the 1933 Act, or except in compliance with an exemption from the registration requirements of the 1933 Act. Unless governing law permits otherwise, any transaction should be executed via a Nomura entity in your home jurisdiction.

This document has been approved for distribution in the UK and European Economic Area as investment research by Nlplc. Nlplc is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Nlplc is a member of the London Stock Exchange. This document does not constitute a personal recommendation within the meaning of applicable regulations in the UK, or take into account the particular investment objectives, financial situations, or needs of individual investors. This document is intended only for investors who are 'eligible counterparties' or 'professional clients' for the purposes of applicable regulations in the UK, and may not, therefore, be redistributed to persons who are 'retail clients' for such purposes. This document has been approved by NIHK, which is regulated by the Hong Kong Securities and Futures Commission, for distribution in Hong Kong by NIHK. This document has been approved for distribution in Australia by NAL, which is authorized and regulated in Australia by the ASIC. This document has also been approved for distribution in Malaysia by NSM. In Singapore, this document has been distributed by NSL. NSL accepts legal responsibility for the content of this document, where it concerns securities, futures and foreign exchange, issued by their foreign affiliates in respect of recipients who are not accredited, expert or institutional investors as defined by the Securities and Futures Act (Chapter 289). Recipients of this document in Singapore should contact NSL in respect of matters arising from, or in connection with, this document. Unless prohibited by the provisions of Regulation S of the 1933 Act, this material is distributed in the US, by NSI, a US-registered broker-dealer, which accepts responsibility for its contents in accordance with the provisions of Rule 15a-6, under the US Securities Exchange Act of 1934. The entity that prepared this document permits its separately operated affiliates within the Nomura Group to make copies of such documents available to their clients.

This document has not been approved for distribution to persons other than ‘Authorised Persons’, ‘Exempt Persons’ or ‘Institutions’ (as defined by the Capital Markets Authority) in the Kingdom of Saudi Arabia (‘Saudi Arabia’) or ‘professional clients’ (as defined by the Dubai Financial Services Authority) in the United Arab Emirates (‘UAE’) or ‘Market Counterparty’ or ‘Business Customers’ (as defined by the Qatar Financial Centre Regulatory Authority) in the State of Qatar (‘Qatar’) by Nomura Saudi Arabia, Nlplc or any other member of the Nomura Group, as the case may be. Neither this document nor any copy thereof may be taken or transmitted or distributed, directly or indirectly, by any person other than those authorised to do so into Saudi Arabia or in the UAE or in Qatar or to any person other than ‘Authorised Persons’, ‘Exempt Persons’ or ‘Institutions’ located in Saudi Arabia or ‘professional clients’ in the UAE or a
‘Market Counterparty’ or ‘Business Customers’ in Qatar. By accepting to receive this document, you represent that you are not located in Saudi Arabia or that you are an ‘Authorised Person’, an ‘Exempt Person’ or an ‘Institution’ in Saudi Arabia or that you are a ‘professional client’ in the UAE or a ‘Market Counterparty’ or ‘Business Customers’ in Qatar and agree to comply with these restrictions. Any failure to comply with these restrictions may constitute a violation of the laws of the UAE or Saudi Arabia or Qatar.

Notice to Canadian Investors: This research report is not a personal recommendation and does not take into account the investment objectives, financial situation or particular needs of any particular individual or account. It is made available to you in reliance on NI 31-103, section 8.25.

For report with reference of TAIWAN public companies or authored by Taiwan based research analyst:

THIS DOCUMENT IS SOLELY FOR REFERENCE ONLY. You should independently evaluate the investment risks and are solely responsible for your investment decisions. NO PORTION OF THE REPORT MAY BE REPRODUCED OR QUOTED BY THE PRESS OR ANY OTHER PERSON WITHOUT WRITTEN AUTHORIZATION FROM NOMURA GROUP. Pursuant to Operational Regulations Governing Securities Firms Recommending Trades in Securities to Customers and/or other applicable laws or regulations in Taiwan, you are prohibited to provide the reports to others (including but not limited to related parties, affiliated companies and any other third parties) or engage in any activities in connection with the reports which may involve conflicts of interests. INFORMATION ON SECURITIES / INSTRUMENTS NOT EXECUTABLE BY NOMURA INTERNATIONAL (HONG KONG) LTD., TAIPEI BRANCH IS FOR INFORMATIONAL PURPOSES ONLY AND IS NOT BE CONSTRUED AS A RECOMMENDATION OR A SOLICITATION TO TRADE IN SUCH SECURITIES / INSTRUMENTS.

NO PART OF THIS MATERIAL MAY BE (I) COPIED, PHOTOCOPIED, OR DUPLICATED IN ANY FORM, BY ANY MEANS; OR (II) REDISTRIBUTED WITHOUT THE PRIOR WRITTEN CONSENT OF A MEMBER OF THE NOMURA GROUP. If this document has been distributed by electronic transmission, such as e-mail, then such transmission cannot be guaranteed to be secure or error-free as information could be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. The sender therefore does not accept liability for any errors or omissions in the contents of this document, which may arise as a result of electronic transmission. If verification is required, please request a hard-copy version.

The Nomura Group manages conflicts with respect to the production of research through its compliance policies and procedures (including, but not limited to, Conflicts of Interest, Chinese Wall and Confidentiality policies) as well as through the maintenance of Chinese Walls and employee training.

Additional information regarding the methodologies or models used in the production of any investment recommendations contained within this document is available upon request by contacting the Research Analysts listed on the front page. Disclosures information is available upon request and disclosure information is available at the Nomura Disclosure web page: http://go.nomuranow.com/research/globalresearchportal/pages/disclosures/disclosures.aspx

Copyright © 2017 Nomura Securities International, Inc. All rights reserved.