Completed 09 Jan 2018 11:18 AM EST
Disseminated 09 Jan 2018 11:18 AM EST
North America Fixed Income Strategy
09 January 2018

J.P.Morgan

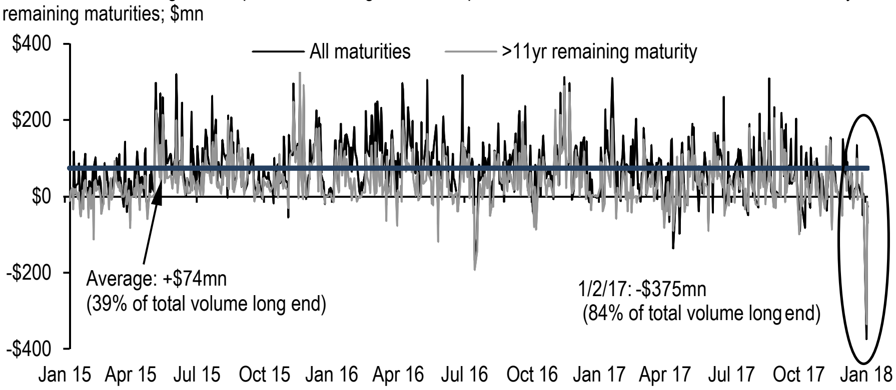
Overnight selling and Taiwanese corporate demand

- The first trading day of 2018 brought with it the most substantial overnight net selling by investors of long-dated corporates in several years.
- The timing of the selling and the characteristics of the bonds sold suggest Asian real money, particularly Taiwanese Life Insurance companies.
- These investors have represented a recurring part of the demand for USD assets in the last few years, especially High Grade corporate bonds in the long end.
- Taiwanese Life Insurance companies have amassed approximately \$450bn of exposure to overseas assets (including about \$270bn of public securities, the majority of which are long-dated USD HG corporates), which is more than 55% of their total portfolio.
- These sales are likely related to the implementation of IFRS 9 rules, which created the opportunity to monetize gains...
- … which we believe could have been used to offset FX hedging losses that have accumulated in recent months.
- We do not expect any material near-term shift in investment strategy from these investors. However, the rising cost of FX risk management—particularly if the Fed continues hiking—should be a structural headwind to further net acquisitions of USD assets by Taiwanese life insurers.
- In addition to worsening economics, this raises the risk of regulatory intervention, particularly as related to FX hedging and Formosa bonds.

US Fixed Income Strategy
Joshua Younger AC
(1-212) 270-1323
joshua.d.younger@jpmorgan.com
Dominique Toublan AC
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com
Munier Salem
(1-212) 270-0371
munier.salem@jpmorgan.com
Zhan Zhao
(1-212) 834-7218
zhan.zhao@jpmorgan.com
Eric Beinstein
(1-212) 834-4211
eric.beinstein@jpmorgan.com
Paul Glezer
(1-212) 270-8185
paul.x.glezer@jpmorgan.com
J.P. Morgan Securities LLC

Exhibit 1: This past Tuesday saw the largest overnight net client selling of High-Grade corporates since at least early 2015—and by a wide margin—the vast majority of which had relatively long remaining maturities

Notional of net overnight client purchases of High-Grade corporates from TRACE data, all maturities and >11yr remaining maturities; \$mn



Note: Overnight defined as before 7:10am EST. Notionals are based on estimated trading volumes due to caps in TRACE reporting.
Source: J.P. Morgan, TRACE

See page 8 for analyst certification and important disclosures.

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

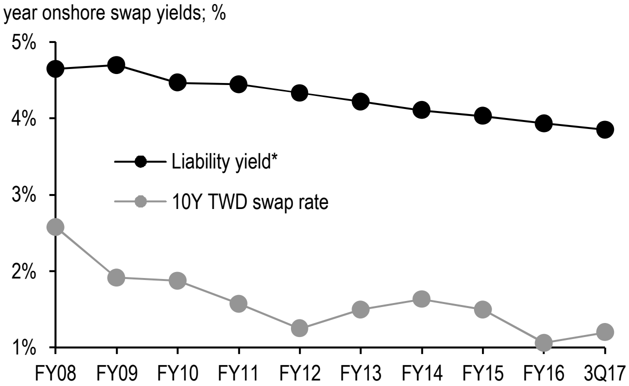
Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

What can overnight selling tell us about the future of Taiwanese demand?[1]

One of the more surprising events to start the year was a sharp pickup in overnight selling of high-grade U.S. corporates. We can see the magnitude of the flows clearly in TRACE data, which show dealers were net buyers of $465mn of bonds before 7:10am EST last week—the largest such outflow in as long as data have been kept, and by a rather wide margin (**Exhibit 1**). In fact, these figures likely underestimate the total selling by non-U.S. investors on Tuesday (as well as subsequent days), since trades often overlap with the early New York session. Additionally, TRACE data only capture trades from FINRA registered broker dealers, excluding overseas trading desks. The timing of this flow strongly suggests the involvement of Asian real money. **And though we cannot be certain of the seller, the vast majority of bonds traded were longer-maturity points (84% of total volume, compared with a longer-run average of 37% and average maturity of 22yrs for large blocks sold by clients overnight as per TRACE) pointing to Life Insurance companies, particularly in Taiwan**.

Exhibit 2: Legacy policies written in the pre-crisis years have kept liability costs among large Taiwanese life insurers elevated even as local asset returns have declined…

Average liability yield among larger Taiwanese insurance companies versus 10-year onshore swap yields; %



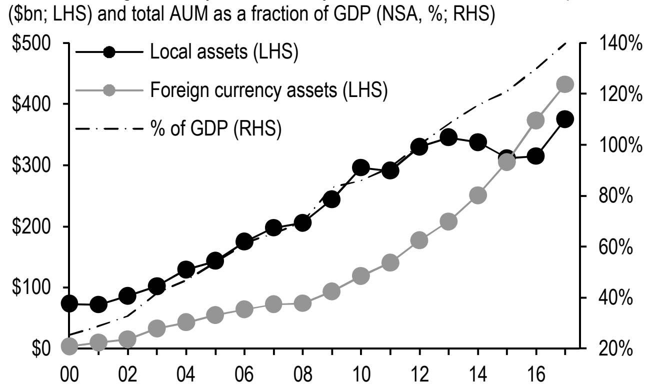
* Includes our equity coverage set: Cathay, China Life, Shin Kong and Fubon Life Insurance. Annual figures with the exception of most recent quarterly disclosure.

Note: Swap yields are averaged over the reporting period.

Source: J.P. Morgan, company filings

Exhibit 3: … and this has led to them to look overseas in search of yield, which combined with regulatory relief has led to their portfolios being now dominated by USD-denominated assets

Local and foreign currency assets held by Taiwanese life insurance companies ($bn; LHS) and total AUM as a fraction of GDP (NSA, %; RHS)



Note: Note: Converted to USD as of the end of the period. Annual data except for this year, for which we have data through November 2017.

Source: J.P. Morgan, Taiwan FSC (Insurance Bureau), Taiwan Life Insurance Institute, Central bank of China (Taiwan), Bloomberg

Why are Taiwanese life insurance companies a common driver of overnight flows in U.S. corporates? In addition to being very large—currently $800bn in total assets, or more than 140% of GDP—the decline in onshore asset returns has forced these investors to look elsewhere to bridge their asset-liability gap. Though a generic problem for life insurance companies globally, the problem is particularly acute in Taiwan. **Among the larger names, liability yields have remained relatively stable over the past ten years—driven in large by high guarantee rates on policies written prior to the 2008 crisis—while easy monetary policy from the CBoC and subdued inflation have pushed local yields lower (Exhibit 2)**.

[1] The below note includes a combined discussion based in part on two recent publications. For details, see *Credit Markets Outlook and Strategy*, E. Beinstein et al., 1/4/18 and Interest Rate Derivatives, *US Fixed Income Markets Weekly*, 1/5/18.

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

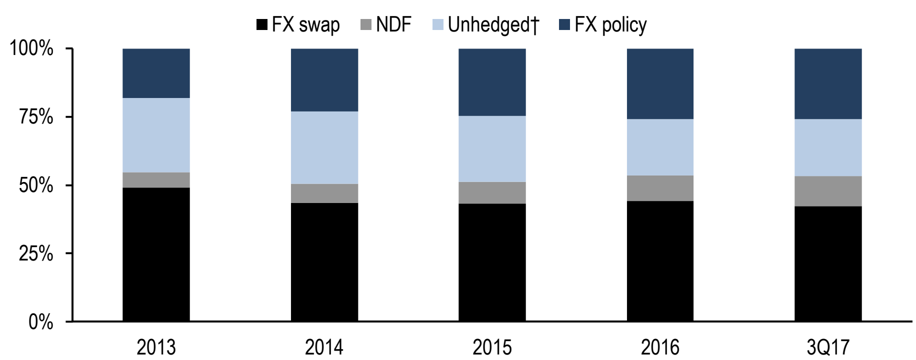
Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

The resulting need for fixed income instruments to invest in combined with the search for higher returns has led them overseas. In addition, the recent regulatory relief has also made foreign currency assets more attractive (including the introduction of Formosa bonds in 2014; for details see *New regulations in Taiwan are bearish for USD vega*, J. Younger et al., 8/20/14). As a consequence, the majority of their asset growth in recent years has been driven by this component of their portfolio (**Exhibit 3**). At this point we believe they have roughly $450bn of exposure to USD-denominated assets, or 56% of total holdings, of which roughly $180bn (40%) are long-dated Formosa-style[2] callables (up more than $100bn net of redemptions since 2015). The remaining $270bn consists primarily of public securities, the majority of which are long-dated USD corporates—with a smaller allocation to other yield enhancement product such as agency CMOs and structured notes. This remaining portion has been growing roughly $30-50bn a year for the past five years.

This represents a significant part of the long-end part of the standard USD HG bond market. There are about $1.5tn of HG corporate bonds that have more than 10 years to maturity in our JULI index, and $1.1tn that have more than 20 years to maturity. We believe that most of the Taiwanese Life Insurers USD HG holdings have more than 20 years left to maturity. Therefore, their holdings represent a non-trivial amount of the very long end USD HG corporate bond market.

Exhibit 4: Only roughly 25% of FX risk in Taiwanese portfolios is term hedged by writing USD policies, with most of the remainder—accounting for half their exposure—managed via the onshore forwards market and a decent fraction relatively unhedged

Fraction of foreign currency assets* by hedge type; %



* Notional balance-weighted across overseas assets held by Cathay, Fubon, Shinkong and China Life.

† Proxy/unhedged includes securities in AFS.

Note: FX policy refers to predominantly (~95%) USD-denominated insurance policies, which act as a natural FX hedge. All as of year-end except current as of 3Q 2017.
Source: J.P. Morgan, company filings

From where is this foreign currency sourced? Typically not from writing USD policies; as of 3Q 2017[3] these accounted for just 26% of total FX hedges (**Exhibit 4**). Rather, they are mostly (42% of total hedging activity, or $176bn in USD assets) borrowed from the central bank via the onshore FX forwards market, usually with 3- to 6-month maturities, with an additional 11% ($46bn) hedged with offshore NDFs

---

[2] Smaller deals and those issued before mid-2014 are not registered locally, and therefore not technically "Formosa bonds" but are comparable in all relevant respects (issuers, lockout terms, maturities, call frequency, etc.).
[3] Includes a sample of large insurers based on our equity coverage: Cathay, Nanshan, China Life, and Fubon.

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

(Non-Deliverable Forwards). **This portion of their portfolio incurs ongoing costs from negative FX carry owing to higher front-end USD versus TWD rates and a negative onshore cross-currency basis** (see discussion below). The remainder (21%, or $80bn) is either not hedged at all or with proxies, and therefore mostly exposed to short term exchange rate fluctuations. **This could lead to further losses in the event that USD/TWD continues its decline**.

Having accumulated such a large portfolio of U.S. corporates, why the sudden bout of selling? In part we believe this reflect the implementation of IFRS 9 in Taiwan, which took effect this calendar year. Though well-advertised, the major impact for these investors is that they have to reclassify each individual bond to fit into the new IFRS categories. We do not believe that this signals a change in investment strategy, but that this has led some Life Insurance companies to take advantage of this reclassification opportunity to realize gains on bonds that were classified as "Hold To Maturity" (HTM) or "Inactive Market," possibly to offset losses on other instruments such as the FX hedges they have in place.

As discussed above, Taiwanese insurance companies hold 'regular' USD corporate bonds (mostly long end) and also Formosa bonds, which are USD bonds from US issuers, but generally with a call provision, and sometimes registered in Taiwan. These bonds are structured to be attractive to the Taiwan life insurance community and are generally only held by the insurers there. **It is logical that the change in MTM rules has led to selling in 'regular' USD bonds rather than callable bonds/Formosa bonds as callable bonds prices cannot increase by a significant amount above the call option strike and Formosa bonds are usually only held onshore**.

The three new accounting categories more or less correspond to the old categories. In essence, the "Amortized Cost" (AC) classification is similar to the previous HTM and Inactive Market categories with bonds held at amortized cost and not sensitive to mark-to-market. The "Fair Value through Other Comprehensive Income" (FVOCI) is similar to the old "Available For Sale" (AFS) category, where bonds are marked to market, but the PnL goes into "Other Comprehensive Income" (OCI) and so flows into the balance sheet rather than into the income statement. Finally, the "Fair Value though Profit or Loss" (FVPL) category is similar to the old Trading category, with the bonds Mark-to-Market and the PnL reported on the income statement and thus impacts Earnings and EPS.

We believe that most Life Insurance companies will classify most of their corporate bonds in the AC category (as their liabilities are not Mark-to-Market) and the rest as FVOCI (so that bond price fluctuations do not affect their income statement). Note that slightly less than 20% of the Fixed Income holdings of Taiwanese Life Insurance companies were classified as AFS and less than 1% as Trading in the old categories. We believe that this will not materially change going forward, with most Fixed Income classified as AC. However, it is likely that relatively more non-callable and non-Formosa bonds will be classified as FVOCI as these are easier to use to actively manage the investment portfolio.

That said, it is particularly notable that these bonds were in fact sold. Assuming that some of these bonds were previously classified as HTM, moving them into the FVOCI category would have led to accounting gains on the balance sheet (but not on the income statement and earnings). **We believe this points to a greater purpose: by realizing the P/L these profits flow through income, and can be used to offset losses associated with FX hedging activity**. Considering the composition of a

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

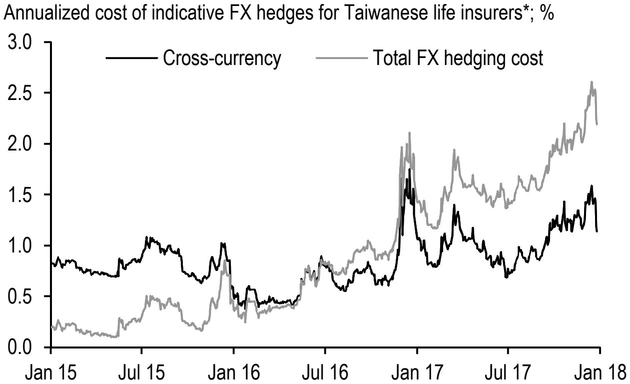
typical Taiwanese life insurance portfolio—i.e., a mix of High-Grade corporates, callables, CMOs and structured notes—selling highly liquid High-Grade paper would likely be the easiest way to raise these funds.

The bonds sold last week are "average" liquid bonds. A detailed analysis of the bonds sold last week shows that they had a similar price as the average price of the bonds in our long-end JULI index and with credit ratings skewed higher than the average. This is based on Investment Grade dealer buys of $5mn or larger during the early morning hours (before 7:10am EST) on Jan 2-4, 2018, as per TRACE.

Non-Financial bonds represented 2/3 of these overnight trades. 54% of bonds traded were A rated and 29% were BBB rated. The Banks sector represented 1/3 of overnight block trades. Within the traded Bank bonds, 2/3 were Domestic banks and 1/3 were Yankee bank bonds. After Banks, Transportation, Capital Goods and Energy made up the other top sectors, representing around 10% each of the total bonds sold by clients overnight. Bank bonds represented a disproportionately higher percentage of overnight client sells compared with their market share while Utilities, Consumer and Insurance bonds were the largest absentee sectors with no trades in the sector's bonds. North American domiciled companies represented the majority of bonds that traded (79%)

Exhibit 5: The Fed hiking cycle, and resulting move higher in front-end USD versus TWD yields, has significantly increased FX hedging costs for life insurers, exacerbated by the cross-currency basis…

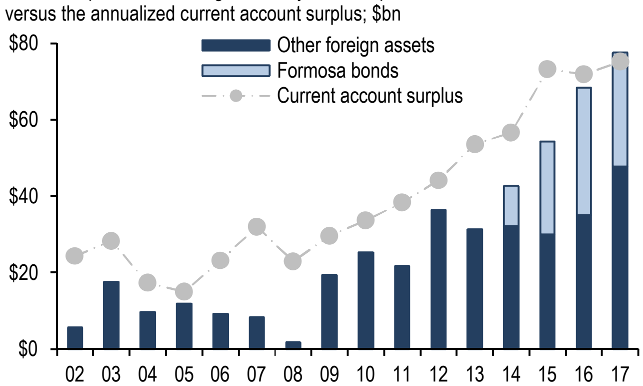
Annualized cost of indicative FX hedges for Taiwanese life insurers*; %



* Estimated from annualized carry on 3-month onshore FX swaps. Cross-currency basis is derived from the same.
Source: J.P. Morgan

Exhibit 6: … the latter of which likely reflect at least in part the fact that net acquisitions of USD assets by these investors are now outpacing the total current account surplus

Annual acquisitions of foreign currency assets, split into Formosa bonds and others, versus the annualized current account surplus; $bn



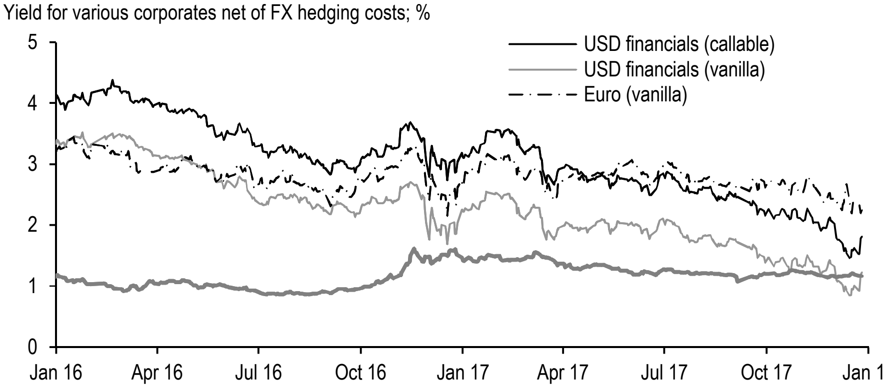
Note: Taiwanese foreign currency life insurance assets (reported in local currency) converted to USD as of the end of the period using spot USD/TWD exchange rates. Anecdotally roughly 90% of these assets are USD-denominated. For this year we annualize using current account data through 3Q and life insurance holdings through November 2017.
Source: J.P. Morgan, Taiwan FSC (Insurance Bureau), Taiwan Life Insurance Institute, Central bank of China (Taiwan), Bloomberg

We believe that selling "standard" bonds indicates a tactical/opportunistic trade rather than a structural change in investment strategy. Indeed, it is normal for an investor to actively manage the instruments classified as FVOCI (i.e., the old AFS). It is therefore meaningful that they did not sell less liquid bonds that are more likely to be classified as AC (i.e., the old HTM). Indeed, if the goal was to realize the largest possible price gain, then selling illiquid bonds would have been a better strategy: illiquid bonds have outperformed in the 2017 rally, as they usually do when there is a long market rally and low volatility.

Nevertheless, this might indicate more acute FX funding pressures in the onshore USD/TWD market As we discuss in a prior publication (see *The future ain't what it used to be*, J. Younger et al., 10/20/17), thanks to rapid growth in their foreign currency assets, Taiwanese life insurance portfolios are now more than 55% USD-denominated (relative to 38% five years ago). Because they only write a rather small percentage of USD policies, the rest of this portfolio is funded with short-term FX swaps. **The carry cost of these positions has been increasing thanks to the combined effects of both a wider front-end yield differential and more negative onshore cross-currency basis (Exhibit 5)**. The latter likely reflects the relative scarcity of onshore dollars, as net acquisitions of foreign currency assets (more than 90% of which are USD) is now comparable to the entire current account surplus (**Exhibit 6**).

Exhibit 7: Taking into account FX hedging costs, USD-denominated callables are now offer comparable net yields to EUR financials

Yield for various corporates net of FX hedging costs; %



Note: USD vanilla financials from the JULI index for long-dated corporates. Indicative zero coupon callable IRRs are estimated assuming a funding spread equal to the average 5-year CDS spread of Libor panel banks. Euro financials are 30-year swap rates plus10-year iBoxx CDS spreads. FX costs are the annualized 3-month carry for an onshore swap.
Source: J.P. Morgan

Reflecting this, EUR-denominated benchmark corporates—i.e., non-callable paper—currently offer higher net yields (and neither are much higher than local sovereigns; Exhibit 7). In recent news, the local regulators (FSC) recently announced new, stricter FX risk management rules; we believe these tighter controls likely increase overall hedging costs, all else equal (see discussion in *Taiwan insurance*, J. Huang et al., 1/5/18). Not to mention the progression of the Fed hiking cycle, where we expect four hikes as compared to less than three currently priced in; this should push front-end USD yields higher relative to both G4 and TWD rates.

A closer analysis of the yields of corresponding EUR and USD denominated bonds from the same issuer and with a similar time to maturity shows that the "realized" yields for Taiwanese investors have been in line for a few months after hedging for FX risk with a 3m FX forward[4]. As shown in Exhibit 9, the USD hedging costs for Taiwanese investors steadily increased over the last two years while the EUR hedging cost remained relatively constant. As a consequence, EUR and USD bonds have traded on top of each other for a Taiwanese investor who hedges with the respective FX forwards. Furthermore, our bond pairs analysis shows that it has been advantageous for a Taiwanese investor to buy EUR bonds in the long end (10-30yr) for the past several months. The 7-10 year category shows a similar trend. The recent cheapening of the USD/TWD 3m FX hedge has brought the

[4] This is based on a portfolio of approximately 350 matching bond pairs.

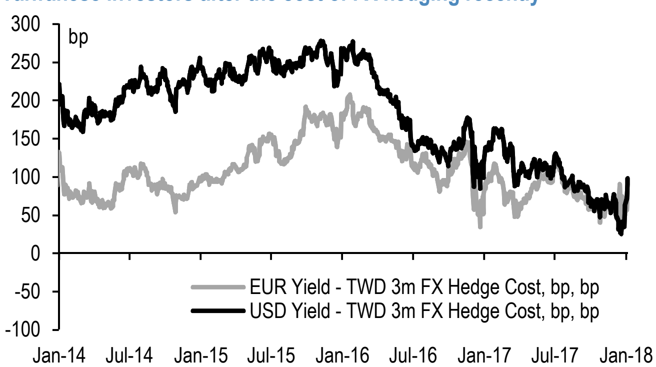
Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

attractiveness of EUR and USD bonds in line again, however. The analysis shows very similar results when looking at Fins and Non-Fins individually. **As shown in the exhibit below, this has been true for several months. However, we have not heard of any anecdotal evidence that Taiwanese investors have increased their EUR HG corporate bond buying programs over the last year.**

To be clear, we do not expect a wholesale repositioning of Taiwanese life insurance company portfolios at this point, nor a substantial change in their near-term shift in their investment strategy. And the availability of onshore assets remains an important constraint. Turning to Euros is a clear alternative given the relative pricing; however, at this point liquidity in that callable market remains much less than in USD. **But all else equal, rising FX hedging costs likely constrain their ability to purchase USD assets at the same pace as the past couple of years**. **And for callables in particular, it raises the prospect of intervention in the Formosa bond market, which was created specifically to circumvent control on foreign currency exposure**.

Exhibit 8: EUR and USD HG realized yields have been in line for Taiwanese investors after the cost of FX hedging recently



Source: J.P. Morgan

Exhibit 9: The 3m TWD/USD 3m FX hedge has cheapened recently, slightly more than the TWD/EUR 3m FX hedge

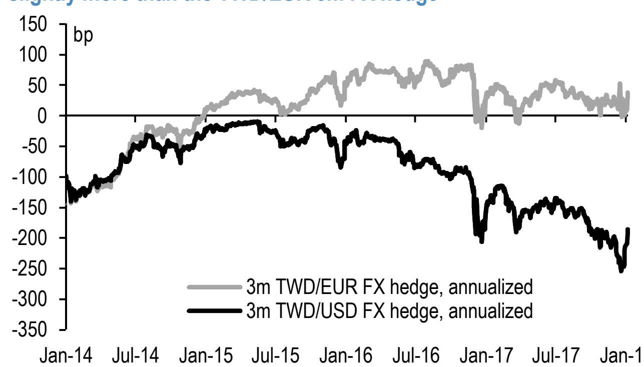
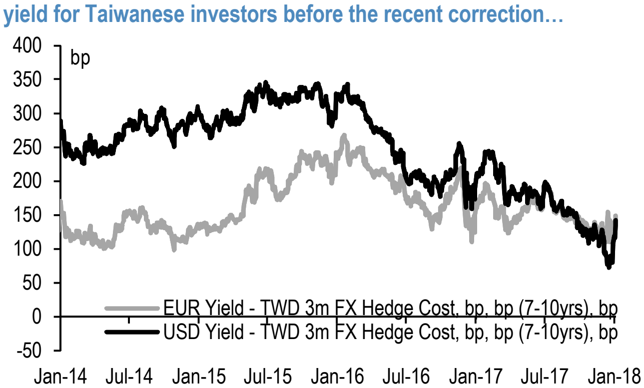
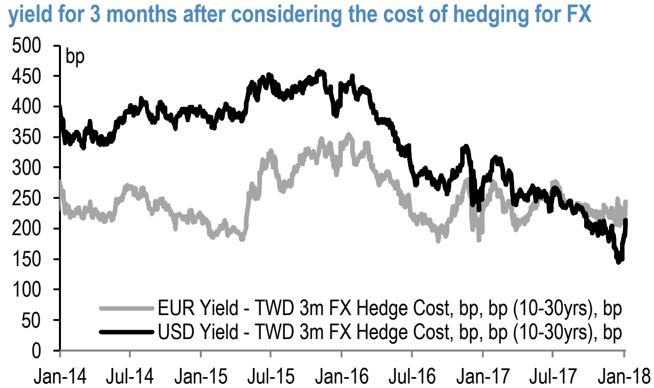


Exhibit 9: 7-10yr EUR HG corporates briefly offered a higher realized yield for Taiwanese investors before the recent correction…



Source: J.P. Morgan

Exhibit 10: … while 10-30yr EUR HG corporates had offered a higher yield for 3 months after considering the cost of hedging for FX



Note: FX hedge costs from 3-month onshore USD/TWD and EUR/USD 3-months forward versus spot.

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

Disclosures

Analyst Certification: The research analyst(s) denoted by an "AC" on the cover of this report certifies (or, where multiple research analysts are primarily responsible for this report, the research analyst denoted by an "AC" on the cover or within the document individually certifies, with respect to each security or issuer that the research analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect his or her personal views about any and all of the subject securities or issuers; and (2) no part of any of the research analyst's compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst(s) in this report. For all Korea-based research analysts listed on the front cover, they also certify, as per KOFIA requirements, that their analysis was made in good faith and that the views reflect their own opinion, without undue influence or intervention.

Important Disclosures

Company-Specific Disclosures: Important disclosures, including price charts and credit opinion history tables, are available for compendium reports and all J.P. Morgan–covered companies by visiting https://www.jpmm.com/research/disclosures, calling 1-800-477-0406, or e-mailing research.disclosure.inquiries@jpmorgan.com with your request. J.P. Morgan's Strategy, Technical, and Quantitative Research teams may screen companies not covered by J.P. Morgan. For important disclosures for these companies, please call 1-800-477-0406 or e-mail research.disclosure.inquiries@jpmorgan.com.

Explanation of Credit Research Valuation Methodology, Ratings and Risk to Ratings:
J.P. Morgan uses a bond-level rating system that incorporates valuations (relative value) and our fundamental view on the security. Our fundamental credit view of an issuer is based on the company's underlying credit trends, overall creditworthiness and our opinion on whether the issuer will be able to service its debt obligations when they become due and payable. We analyze, among other things, the company's cash flow capacity and trends and standard credit ratios, such as gross and net leverage, interest coverage and liquidity ratios. We also analyze profitability, capitalization and asset quality, among other variables, when assessing financials. Analysts also rate the issuer, based on the rating of the benchmark or representative security. Unless we specify a different recommendation for the company's individual securities, an issuer recommendation applies to all of the bonds at the same level of the issuer's capital structure. This report also sets out within it the material underlying assumptions used.

We use the following ratings for bonds (issues) and issuers: Overweight (over the next three months, the recommended risk position is expected to outperform the relevant index, sector, or benchmark); Neutral (over the next three months, the recommended risk position is expected to perform in line with the relevant index, sector, or benchmark); and Underweight (over the next three months, the recommended risk position is expected to underperform the relevant index, sector, or benchmark). J.P. Morgan Emerging Markets Sovereign Research uses Marketweight, which is equivalent to Neutral. NR is Not Rated. In this case, J.P. Morgan has removed the rating for this particular security or issuer because of either a lack of a sufficient fundamental basis or for legal, regulatory or policy reasons. The previous rating no longer should be relied upon. An NR designation is not a recommendation or a rating. NC is Not Covered. An NC designation is not a rating or a recommendation.

For CDS, we use the following rating system: Long Risk (over the next three months, the credit return on the recommended position is expected to exceed the relevant index, sector or benchmark); Neutral (over the next three months, the credit return on the recommended position is expected to match the relevant index, sector or benchmark); and Short Risk (over the next three months, the credit return on the recommended position is expected to underperform the relevant index, sector or benchmark).

Implicit in a J.P. Morgan credit rating is the analyst's consideration of the underlying risks to the investment thesis. Risks may reflect company-specific, industry-specific, and, when relevant, macro factors. These factors are given weight to the extent that they impact a company's cash flow and leverage metrics, for example.

J.P. Morgan Credit Research Ratings Distribution, as of January 02, 2018

	Overweight	Neutral	Underweight
Global Credit Research Universe	26%	57%	17%
IB clients*	65%	66%	61%

Note: The Credit Research Rating Distribution is at the issuer level. Please note that issuers with an NR or an NC designation are not included in the table above.
*Percentage of investment banking clients in each rating category.

Analysts' Compensation: The research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues.

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

Other Disclosures

J.P. Morgan ("JPM") is the global brand name for J.P. Morgan Securities LLC ("JPMS") and its affiliates worldwide. J.P. Morgan Cazenove is a marketing name for the U.K. investment banking businesses and EMEA cash equities and equity research businesses of JPMorgan Chase & Co. and its subsidiaries.

Options related research: If the information contained herein regards options related research, such information is available only to persons who have received the proper option risk disclosure documents. For a copy of the Option Clearing Corporation's Characteristics and Risks of Standardized Options, please contact your J.P. Morgan Representative or visit the OCC's website at https://www.theocc.com/components/docs/riskstoc.pdf

Legal Entities Disclosures
U.S.: JPMS is a member of NYSE, FINRA, SIPC and the NFA. JPMorgan Chase Bank, N.A. is a member of FDIC. **U.K**.: JPMorgan Chase N.A., London Branch, is authorised by the Prudential Regulation Authority and is subject to regulation by the Financial Conduct Authority and to limited regulation by the Prudential Regulation Authority. Details about the extent of our regulation by the Prudential Regulation Authority are available from J.P. Morgan on request. J.P. Morgan Securities plc (JPMS plc) is a member of the London Stock Exchange and is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Registered in England & Wales No. 2711006. Registered Office 25 Bank Street, London, E14 5JP. **South Africa**: J.P. Morgan Equities South Africa Proprietary Limited is a member of the Johannesburg Securities Exchange and is regulated by the Financial Services Board. **Hong Kong**: J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong and/or J.P. Morgan Broking (Hong Kong) Limited (CE number AAB027) is regulated by the Securities and Futures Commission in Hong Kong. **Korea**: This material is issued and distributed in Korea by or through J.P. Morgan Securities (Far East) Limited, Seoul Branch, which is a member of the Korea Exchange(KRX) and is regulated by the Financial Services Commission (FSC) and the Financial Supervisory Service (FSS). **Australia**: J.P. Morgan Australia Limited (JPMAL) (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (JPMSAL) (ABN 61 003 245 234/AFS Licence No: 238066) is regulated by ASIC and is a Market, Clearing and Settlement Participant of ASX Limited and CHI-X. **Taiwan**: J.P.Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Bureau. **India:** J.P. Morgan India Private Limited (Corporate Identity Number - U67120MH1992FTC068724), having its registered office at J.P. Morgan Tower, Off. C.S.T. Road, Kalina, Santacruz - East, Mumbai – 400098, is registered with Securities and Exchange Board of India (SEBI) as a 'Research Analyst' having registration number INH000001873. J.P. Morgan India Private Limited is also registered with SEBI as a member of the National Stock Exchange of India Limited (SEBI Registration Number - INB 230675231/INF 230675231/INE 230675231), the Bombay Stock Exchange Limited (SEBI Registration Number - INB 010675237/INF 010675237) and as a Merchant Banker (SEBI Registration Number - MB/INM000002970). Telephone: 91-22-6157 3000, Facsimile: 91-22-6157 3990 and Website: www.jpmipl.com. For non local research reports, this material is not distributed in India by J.P. Morgan India Private Limited. **Thailand**: This material is issued and distributed in Thailand by JPMorgan Securities (Thailand) Ltd., which is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission and its registered address is 3rd Floor, 20 North Sathorn Road, Silom, Bangrak, Bangkok 10500. **Indonesia**: PT J.P. Morgan Securities Indonesia is a member of the Indonesia Stock Exchange and is regulated by the OJK a.k.a. BAPEPAM LK. **Philippines**: J.P. Morgan Securities Philippines Inc. is a Trading Participant of the Philippine Stock Exchange and a member of the Securities Clearing Corporation of the Philippines and the Securities Investor Protection Fund. It is regulated by the Securities and Exchange Commission. **Brazil**: Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Mexico**: J.P. Morgan Casa de Bolsa, S.A. de C.V., J.P. Morgan Grupo Financiero is a member of the Mexican Stock Exchange and authorized to act as a broker dealer by the National Banking and Securities Exchange Commission. **Singapore:** This material is issued and distributed in Singapore by or through J.P. Morgan Securities Singapore Private Limited (JPMSS) [MCI (P) 202/03/2017 and Co. Reg. No.: 199405335R], which is a member of the Singapore Exchange Securities Trading Limited and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) [MCI (P) 059/09/2017], both of which are regulated by the Monetary Authority of Singapore. This material is issued and distributed in Singapore only to accredited investors, expert investors and institutional investors, as defined in Section 4A of the Securities and Futures Act, Cap. 289 (SFA). This material is not intended to be issued or distributed to any retail investors or any other investors that do not fall into the classes of "accredited investors," "expert investors" or "institutional investors," as defined under Section 4A of the SFA. Recipients of this document are to contact JPMSS or JPMCB Singapore in respect of any matters arising from, or in connection with, the document. **Japan**: JPMorgan Securities Japan Co., Ltd. and JPMorgan Chase Bank, N.A., Tokyo Branch are regulated by the Financial Services Agency in Japan. **Malaysia**: This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-X) which is a Participating Organization of Bursa Malaysia Berhad and a holder of Capital Markets Services License issued by the Securities Commission in Malaysia. **Pakistan**: J. P. Morgan Pakistan Broking (Pvt.) Ltd is a member of the Karachi Stock Exchange and regulated by the Securities and Exchange Commission of Pakistan. **Saudi Arabia**: J.P. Morgan Saudi Arabia Ltd. is authorized by the Capital Market Authority of the Kingdom of Saudi Arabia (CMA) to carry out dealing as an agent, arranging, advising and custody, with respect to securities business under licence number 35-07079 and its registered address is at 8th Floor, Al-Faisaliyah Tower, King Fahad Road, P.O. Box 51907, Riyadh 11553, Kingdom of Saudi Arabia. **Dubai**: JPMorgan Chase Bank, N.A., Dubai Branch is regulated by the Dubai Financial Services Authority (DFSA) and its registered address is Dubai International Financial Centre - Building 3, Level 7, PO Box 506551, Dubai, UAE.

Country and Region Specific Disclosures
U.K. and European Economic Area (EEA): Unless specified to the contrary, issued and approved for distribution in the U.K. and the EEA by JPMS plc. Investment research issued by JPMS plc has been prepared in accordance with JPMS plc's policies for managing conflicts of interest arising as a result of publication and distribution of investment research. Many European regulators require a firm to establish, implement and maintain such a policy. Further information about J.P. Morgan's conflict of interest policy and a description of the effective internal organisations and administrative arrangements set up for the prevention and avoidance of conflicts of interest is set out at the following link https://www.jpmorgan.com/jpmpdf/1320742677360.pdf. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction. **Australia:** This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. This material does not take into account the specific investment objectives, financial situation or particular needs of the recipient. The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the term "wholesale client" has the

Joshua Younger
(1-212) 270-1323
joshua.d.younger@jpmorgan.com

Dominique Toublan
(1-212) 834-2370
dominique.d.toublan@jpmorgan.com

meaning given in section 761G of the Corporations Act 2001. **Germany:** This material is distributed in Germany by J.P. Morgan Securities plc, Frankfurt Branch which is regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. **Hong Kong:** The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for Persons Licensed by or Registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider/market maker for derivative warrants, callable bull bear contracts and stock options listed on the Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: http://www.hkex.com.hk. **Korea:** This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Limited, Seoul Branch. **Singapore:** As at the date of this report, JPMSS is a designated market maker for certain structured warrants listed on the Singapore Exchange where the underlying securities may be the securities discussed in this report. Arising from its role as designated market maker for such structured warrants, JPMSS may conduct hedging activities in respect of such underlying securities and hold or have an interest in such underlying securities as a result. The updated list of structured warrants for which JPMSS acts as designated market maker may be found on the website of the Singapore Exchange Limited: http://www.sgx.com. In addition, JPMSS and/or its affiliates may also have an interest or holding in any of the securities discussed in this report – please see the Important Disclosures section above. For securities where the holding is 1% or greater, the holding may be found in the Important Disclosures section above. For all other securities mentioned in this report, JPMSS and/or its affiliates may have a holding of less than 1% in such securities and may trade them in ways different from those discussed in this report. Employees of JPMSS and/or its affiliates not involved in the preparation of this report may have investments in the securities (or derivatives of such securities) mentioned in this report and may trade them in ways different from those discussed in this report. **Taiwan**: This material is issued and distributed in Taiwan by J.P. Morgan Securities (Taiwan) Limited. According to Paragraph 2, Article 7-1 of Operational Regulations Governing Securities Firms Recommending Trades in Securities to Customers (as amended or supplemented) and/or other applicable laws or regulations, please note that the recipient of this material is not permitted to engage in any activities in connection with the material which may give rise to conflicts of interests, unless otherwise disclosed in the "Important Disclosures" in this material. **India:** For private circulation only, not for sale. **Pakistan:** For private circulation only, not for sale. **New Zealand:** This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL. **Canada:** The information contained herein is not, and under no circumstances is to be construed as, a prospectus, an advertisement, a public offering, an offer to sell securities described herein, or solicitation of an offer to buy securities described herein, in Canada or any province or territory thereof. Any offer or sale of the securities described herein in Canada will be made only under an exemption from the requirements to file a prospectus with the relevant Canadian securities regulators and only by a dealer properly registered under applicable securities laws or, alternatively, pursuant to an exemption from the dealer registration requirement in the relevant province or territory of Canada in which such offer or sale is made. The information contained herein is under no circumstances to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. To the extent that the information contained herein references securities of an issuer incorporated, formed or created under the laws of Canada or a province or territory of Canada, any trades in such securities must be conducted through a dealer registered in Canada. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed judgment upon these materials, the information contained herein or the merits of the securities described herein, and any representation to the contrary is an offence. **Dubai:** This report has been issued to persons regarded as professional clients as defined under the DFSA rules. **Brazil**: Ombudsman J.P. Morgan: 0800-7700847 / ouvidoria.jp.morgan@jpmorgan.com.

General: Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively J.P. Morgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMS and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is indicative as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client 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. JPMS distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a J.P. Morgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

"Other Disclosures" last revised January 01, 2018.