Life comes at you pretty fast

The magnitude of, and risks posed by, the interconnectedness of U.S. and Taiwanese markets

- Taiwan has the second largest financial system, and largest insurance industry, relative to economic output among medium and large nations …
- … and in contrast to other countries with a large current account surplus and stable exchange rates, the private sector has led the accumulation of foreign current assets rather than FX reserves
- Life insurance companies have accounted for the bulk of this activity in recent years, most of which are funded by a mix of FX swaps, left unhedged, or managed with proxies …
- … which has generated a sizeable currency mismatch in their assets (~70% USD) versus their liabilities (~20% USD)
- This has entangled Taiwanese and U.S. markets to a much greater degree than the relative size of their economies or financial systems would suggest
- Though we see no cause for immediate concern, because of its potential impact this makes a tail event in Taiwan a risk worth considering for U.S. markets
- We quantify and describe the impact on USD interest rate volatility, high-grade credit, and mortgage markets, as well as implications for the current monetary policy implementation framework in the U.S.

US Fixed Income Strategy

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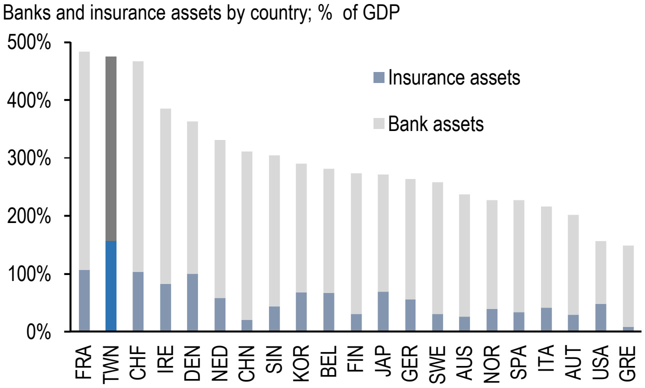
Taiwan, USD Credit and market risk: What has changed and what hasn't

Regular readers of our research have no doubt noted recurrent coverage of changes in the local regulatory environment and investment incentives affecting life insurance companies in Taiwan. Shifts in their behavior have proven a key driver in long-dated U.S. dollar interest rate volatility, as well as high-grade credit and mortgages. **While these considerations have tended to be medium term in horizon, implicit in our discussion has been a rather surprising interconnectedness with U.S. markets**.

In this piece, we take a bit of a step back to reconsider the broader implications, and in particular the tail risks introduced by this dynamic. We begin by elaborating the idiosyncratic aspects of the Taiwanese financial system, particularly the size and investment portfolio of the life insurance industry, in a bit more detail. Then we consider the extent to which **foreign investment activity by these companies has intertwined Taiwan and the U.S. to a much greater degree than one might expect given the relative size of their economies**. At the moment, there is little cause for immediate concern. Nor are there any obvious catalysts on the horizon that might upset this balance. However, given the scale of the potential impact, unlikely though it may be **we think it useful to consider the potential impact of tail risk in Taiwan on U.S. markets**.

Exhibit 1: Taiwan stands out among other countries, particularly EM countries, for the size of its banking and insurance assets as a % of GDP

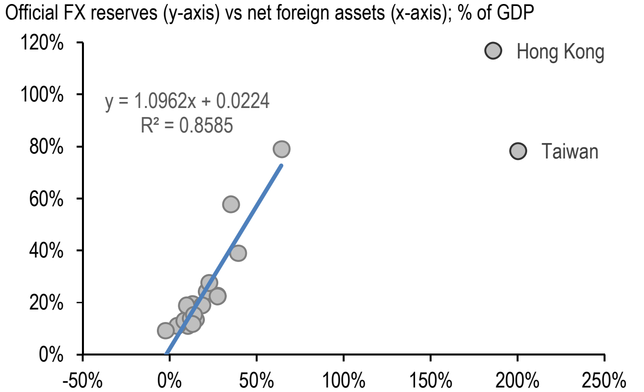
Banks and insurance assets by country; % of GDP



Source: J.P. Morgan, BIS, Taiwan FSC, Central Bank of China (Taiwan), Haver Analytics

Exhibit 2: Taiwan stands out among current account surplus countries both for the size of its net foreign asset position and the extent to which it is held by the private sector

Official FX reserves (y-axis) vs net foreign assets (x-axis); % of GDP



Note: Net foreign assets reported by the World Bank in local currency units, and converted back into dollars. GDP data is taken from country national accounts. Where available, data is as of 2018, otherwise 2017. For Taiwan, we source net foreign assets via their international investment position, reported in dollars. Includes Taiwan, China, Hong Kong, India, Indonesia, South Korea, Malaysia, Singapore, Thailand, Argentina, Brazil, Chile, Colombia, Mexico, Czech Republic, Hungary, Poland, Romania, Russia, South Africa and Turkey.

Source: J.P. Morgan, World Bank, Haver Analytics

The current account and insurance industry foreign asset growth: Why Taiwan is unusual

First, we note that the Taiwanese financial system is particularly large relative to economic output. **When we consider the total balance sheet size of the banking and insurance industries relative to economic activity, Taiwan is second only to France, but with a significant skew towards insurance companies**. Insurance

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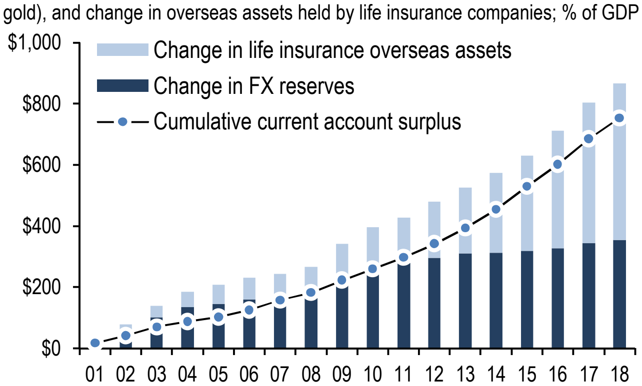
assets in Taiwan are more than 145% of GDP, well above all other major economies (**Exhibit 1**). On other metrics, such as gross insurance premiums to GDP and to population, Taiwan similarly stands out.

As in other countries for which trade is a key driver of economic activity, Taiwan has run persistent current account surpluses for many years, among the largest in the world, in fact, at ~12% of GDP as of Q4 2018. This has, unsurprisingly, led to the steady accumulation of foreign currency assets, which totaled 200% of GDP as of the end of last year ($1.18tn on GDP of ~$580bn). In other such examples, mainland China of course comes to mind, those overseas assets are typically held by the official sector in the form of reserves. **It is very unusual for the accumulation of FX reserves in EM economies to come primarily from outside of the official sector, and in this regard Taiwan stands out as an anomaly (Exhibit 2)**. Given the broad stability of the domestic currency, the balance of payments in Taiwan appears to suggest that **exchange rate management has, to some extent, been outsourced to the private sector.**

Exhibit 3: The growth in foreign assets in Taiwan has been dominated by the life insurance sector for most of the past ten years

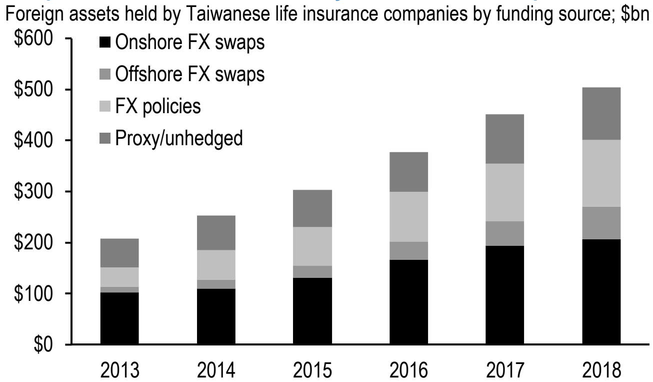
Cumulative change in current account surplus, change in FX reserves (excluding gold), and change in overseas assets held by life insurance companies; % of GDP



Source: J.P. Morgan, Taiwan FSC, Bloomberg

Exhibit 4: Much of the growth in foreign assets held by life insurance companies in Taiwan was funded by short-dated FX swaps ...

Foreign assets held by Taiwanese life insurance companies by funding source; $bn



Note: Based on company disclosure from Cathay, China Life, Fubon, and Shin Kong, grossed up to the size of the overall industry.

Source: J.P. Morgan, Taiwan FSC, company disclosure

Where has this concentration of foreign assets found a home? Mostly in the financial sector, which, as Exhibit 1 attests, is particularly large in Taiwan relative to GDP. Insurance companies in particular are a primary beneficiary of these flows, where they currently make up nearly 70% of the industry aggregated investment portfolio. **Consistent with this assertion, growth in foreign currency assets held by insurance companies accounts for the majority of U.S. dollar inflows (in excess of GDP) from the current account over the past 20 years (Exhibit 3)**.

Particularly notable has been the acceleration of foreign asset growth on life insurance balance sheets since mid-2014. This was largely a result of changes to the regulations governing their investment portfolios. Whereas prior to that date foreign currency holdings were limited to 45% of total invested assets[1], the introduction of Formosa bonds allowed for USD-denominated bonds from foreign issuers which did not count against that cap provided they were registered on the Taipei exchange (see *New regulations in Taiwan are bearish for USD vega*, J. Younger et al., 8/14/17). Largely as a consequence of these rule changes, life

[1] With some adjustments for FX policies.

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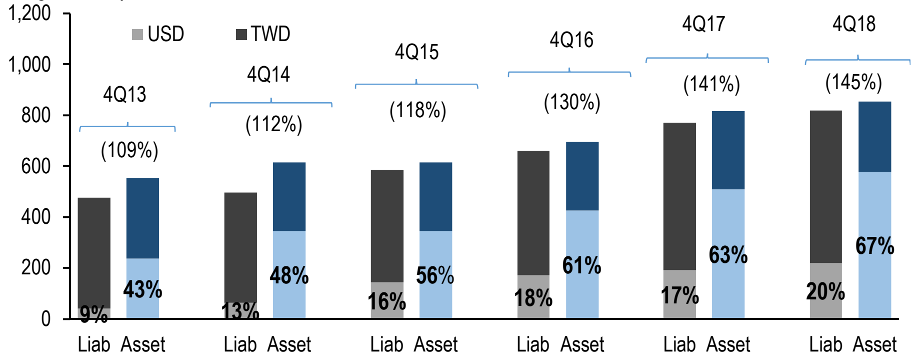
insurance companies added roughly $45bn, $51bn, $74bn, $74bn and $52bn in 2014-18, up from an average of $27bn in the five years prior.

Exhibit 5: ...which has led to a significant and growing currency mismatch on the life insurance balance sheet

Liabilities and assets for the aggregated Taiwanese l ife insurance industry as of year-end, split into domestic and foreign currency*; $bn and % of GDP



Note: FX liabiltiies based on reported aggregate FX policies from Cathay, China Life, Fubon,a nd Shin Kong, grossed up to the size of the industry. Foreign assets from FSC data. Gray and blue indicate assets and liabiltiies, respecrtively, with dark shades referring to domestic currney and light to foreign currency (95% or so of which is likely USD).

Source: J.P. Morgan, Taiwan FSC, Bloomberg, company disclosure

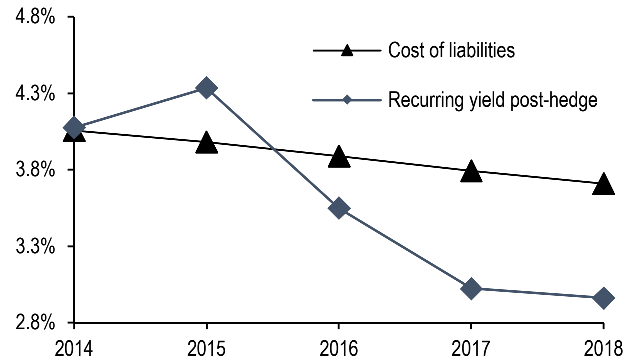
Also somewhat curious is the manner in which these foreign assets are funded. The majority of their U.S. dollars are sourced via the onshore FX swap market, and another quarter likely from spot transactions which are left either unhedged or managed with proxy pairs (**Exhibit 4**). Though FX policies (e.g. insurance policies written in non TWD currencies – usually USD) have grown in recent years, they still represent only 25% or so of foreign currency funding.

This has produced a sizeable mismatch in currency exposure between assets and liabilities in this sector. As of 2013, when FX risk disclosures become commonplace, Taiwanese insurance liabilities were ~9% USD matched against ~43% on the asset side (a ~34% gap). Since then, the writing of USD policies has picked up and overseas assets have grown faster, but still this figure is now closer to a 48% gap (**Exhibit 5**). Because foreign assets in excess of USD policies are effectively funded with short-term rolling FX forwards (or simply not hedged) this constitutes a sizeable duration gap with significant roll risk—effectively a form of leverage. In terms of magnitude, this totals approximately $420bn, or 72% of 2018 Taiwan GDP.

This has been a good trade for most of the past ten years. The negative carry on FX forward hedges was relatively low, reflecting low front-end USD interest rates relative to TWD while both central banks were accommodative and on hold. Combined with a relatively steep USD yield curve this provided significant support to overall portfolio recurring yields relative to domestic investments. In recent years, however, **the progression of a hiking cycle in the U.S. and associated bear flattening has meaningfully eroded these returns as FX hedging costs have risen, reflecting the rise in front-end USD interest rates relative to TWD** (see also discussion in *The future ain't what it used to be*, J. Younger et al., 10/20/17). As a result, **recurring yields net of these costs are substantially lower than estimated liability costs (Exhibit 6)**.

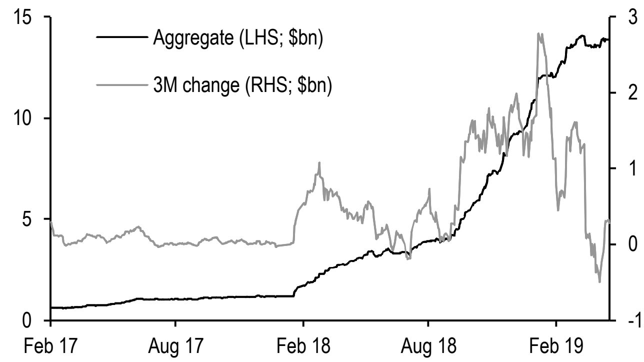
For much of that time, realized trading gains amidst a bull market in EM equities provided an offset, but this is no longer as reliable a source of returns. Though Taiwanese indices have recovered from year-end lows, returns are relatively flat over the past two years. Unsurprisingly, this uncertainty has brought renewed scrutiny of foreign currency exposure, including increasing discussion in the popular press[2].

Exhibit 6: As yields have declined and FX hedging costs have risen, post-hedge recurring yields have been dragged lower
Average recurring yields versus estimated liability cost for large Taiwanese life insurance companies as of 4Q each year; %



Note: Based on a simple average of Cathay, Fubon, Shin Kong, and China Life.
Source: J.P. Morgan, company disclosure

Exhibit 7: AUM of Taiwanese-listed ETFs surged during 2018 and early this year, before stabilizing more recently
Aggregate AUM of Taiwan-listed bond ETFs; $bn



Source: J.P. Morgan, Bloomberg

Since then, regulators have walked back this expansion a bit by imposing more constraints on the Formosa bond market. This started by mandating longer lockout periods to reduce reinvestment risk, though the net impact was simply to shift the preferred structure (see e.g., Interest Rate Derivatives, *US Fixed Income Markets Weekly*, 1/20/17, 6/23/17, 9/29/17). In fact, the same year in which this new rule was introduced was also the peak of foreign private sector demand out of Taiwan. **More recently, regulators have been somewhat more aggressive on this front, imposing a cap on net foreign currency exposure at 65% of invested assets** (see e.g., *Revisiting demand from life insurance companies in Taiwan*, J. Younger et al., 8/17/18, and *Taiwan financials*, J. Huang et al., 8/2/18). Likely as a consequence, the annualized pace of USD asset acquisitions by these investors has dropped by nearly 50% relative to the peak in 2017, and 2019 current tracking a further slowdown.

That said, efficient outlets for demand remain, most recently manifest in the growth of onshore ETFs, which track USD credit indices but are considered onshore for regulatory ratios (see *Taiwanese life insurance demand takes a lETF turn*, J. Younger et al., 1/11/19). Since the start of 2018, the market for these ETFs has grown to nearly $14bn, growing at its peak at a pace of $2.8bn per month. More recently, regulators have taken action to stem their growth as well, placing restrictions on ownership shares, and signaling the likelihood of additional capital charges to provision for embedded FX risk being introduced at some point this year (see Interest Rate Derivatives, *US Fixed Income Markets Weekly*, 4/12/19). While it remains unclear to what extent these restrictions will bind, and affect accumulation going forward, growth in AUM since March has stalled, hovering just below the $14bn mark (**Exhibit 7**).

[2] https://www.cmmedia.com.tw/home/articles/14750 and https://www.chinatimes.com/newspapers/20190321000240-260202?chdtv

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What could possibly go wrong?

On the markets side, any material bear flattening of the USD yield curve would further increase hedging costs relative to recurring yields, exacerbating the asset/liability gap. Poor local equity returns are a risk as well, particularly in light of a recent resumption in risk around trade negotiations with China (see *Near-term risks resume on US-China trade negotiations*, H. Zhu and A. Sandilya, 5/6/19). Another problem scenario would be a spike in FX volatility, particularly given a relatively large portion (~25%) of foreign assets left either unhedged or managed with proxy pairs (e.g., SGD, KRW, or JPY crosses).

Also on the subject of trade, a slowdown in the current account surplus could limit onshore availability of U.S. dollars, leading to a more negative FX/OIS basis, increased hedging costs, and reduced recurring returns net of these hedges. A wave of credit downgrades could increase capital charges, which are assessed mostly on the basis of bond rating, though we do not expect forced selling simply from this dynamic. Of course, there is the unknown impact of the lowest fertility rate in the world[3], including rising dependency ratios and population declines in Taiwan over the next few years (e.g., NDC projections available on their website).

There is also the tail risk of a pick-up in surrender activity—e.g. policy holders ending their policies and taking out the current value. This, at first, appears somewhat far fetched, given limited onshore investment alternatives, but perhaps not so much as it sounds. Until recently many policies were designed to compete with bank deposits, and featured relatively short surrender charge periods. To the extent recurring yields continue to lag liability costs at these insurers and/or domestic equities underperform, the incentives facing current policyholders could start to shift. It is not unreasonable to speculate that a sizeable fraction (perhaps a majority) of life insurance liabilities in Taiwan no longer have significant charges, and therefore could be surrendered for their cash value. **Though again a low probability, tail risk event, in our view, were surrenders to rise materially, insurers could be forced to sell assets. In the extreme, this could include their foreign holdings, even callables**.

To be clear, we do not consider any of these risks as either high probability or imminent, particularly those with the severity to potentially trigger a systemic event. Perhaps most importantly, we would expect the government, regulators, and official sector to act quickly to mitigate any emergent stress. They likely have a range of powerful tools to do so. However, to the extent that the market perceives an increased risk of the more negative outcomes, it could be rather quickly priced into affected asset classes. **Though such an event would have a range of economic and market impacts, including the risk of a sharp increase in demand for the local currency, in this piece we specifically focus on the implications for U.S. markets, including volatility, credit, mortgages, and Fed funds.**

Impact on callables, corporate credit and MBS

Whatever the catalyst, in the event of an actual or perceived need to sell assets the key considerations for U.S. markets will be the size and composition of Taiwanese overseas portfolios. We believe a significant share (roughly $171bn, or 38% of the foreign fixed income portfolio) consist of illiquid callable bonds (in many cases, Formosa bonds; Exhibit 7). Most are issued by large international

[3] According to a recent report from the World Population Review.

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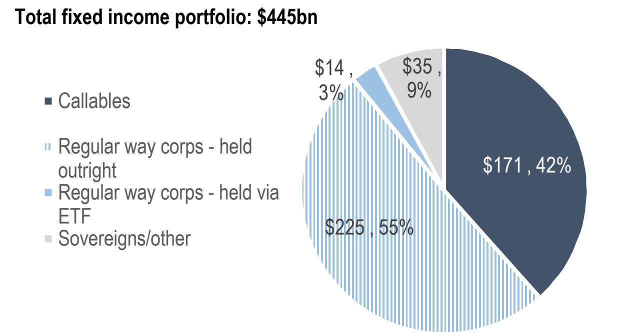
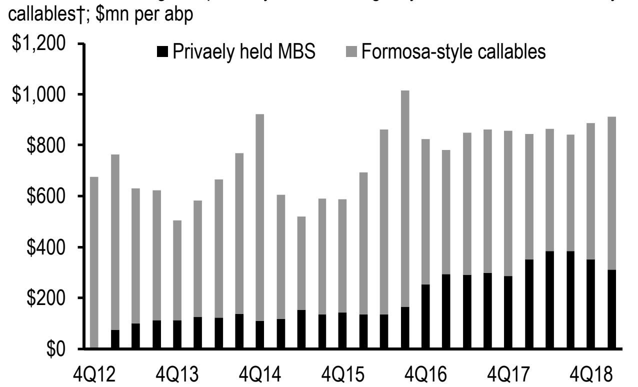
dealers, e.g. large banks and broker/dealers in the U.S., Europe and Japan, and non-financial corporates (AT&T, Verizon, etc.), but there is also significant representation from smaller local banks in the region. Because the issuer of these bonds has the right to call them at par (including accretion effects in the case of zero coupons), this constitutes a net sale of options on interest rates by the Taiwanese life insurance community.

Exhibit 8: Callable bonds represent a significant fraction of the combined overseas fixed income portfolio of Taiwanese life insurers
Estimated holdings by asset class; %



Note: Based on outstanding notional of Formosa and Formosa-style callable bonds, outstanding notional of fixed income ETFs listed on the Taiwanese stock exchange. Sovereign/other and regular way corporate holdings inferred based on company disclosures from the big 4 insurers.
Source: J.P. Morgan, Bloomberg, company disclosures

Exhibit 9: Taiwanese demand for callable bonds has driven substantial growth in that market, and the volatility risk generated by the flow now rivals privately-held U.S. agency MBS
Estimated dollar vega for privately-held* U.S. agency MBS versus Formosa-style callables†; $mn per abp



* J.P. Morgan Agency MBS Index constituents net of Fed SOMA and foreign official holdings.
† Includes zero coupon and fixed rate callables with 20 years or longer initial maturities. We model them as Bermudan style cancelable swaps struck at par as of the announcement date with annual call frequency and lockout/maturity details from Bloomberg data.
Source: J.P. Morgan, Bloomberg, FRBNY, TIC

How much volatility risk have they sold? We estimate the dollar vega exposure of the aggregate stock of callables currently exceeds $300mn per abp. Given a typical moves in options market pricing (e.g., 10Yx10Y swaptions implied volatility), **this translates to a $10-15 P/L weekly event for each and every person in Taiwan**. A more economically relevant comparison, however, is to the mortgage market in the U.S., which sells volatility via borrower prepayment options. Based on our estimates, the short volatility risk associated with callables is comparable to that in privately-held agency MBS—a seismic shift relative to even a few years ago (**Exhibit 9**). **In this way, the growth of Taiwanese life insurance companies coupled with their search for yield has fundamentally shifted the structure and balance of flows in U.S. interest rate options markets**.

The remainder of their stock of foreign assets (62%) is likely dominated by high-grade long-end corporates ($225bn), and a smaller proportion of SSAs and sovereigns. While the Taiwanese insurers do not explicitly report industry-level exposures, the vast majority of the callable portfolio are financials, and based on limited reporting data, we can infer that financials likely represent a very small fraction of the regular way corporate portfolio.

Arguably the largest impact of asset sales out of Taiwan will be felt by USD interest rate volatility markets. As noted above, we estimate total short option risk in U.S. markets totals a bit more than $900mn per abp in dollar vega risk. Of that, roughly one third can be attributed directly to Formosa-style callables. Further, depending on where rates and vol are trading this figure can be even higher: e.g., closer to 46% as of 3Q 2018.

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This flow has already slowed significantly, but the stock remains high. As a consequence, the tail risk primarily at issue here is one in which callables themselves are sold and/or put back to the issuer. This represents a rather extreme outcome given theoretical MTM and liquidity considerations. E**ven a somewhat higher perceived risk that it might occur would have a significant and impulsive impact on volatility markets, led by longer expiries**. Based off a principal components decomposition of the USD swaption grid in comparison to those markets that have been less affected by Taiwanese demand, we estimate that callables supply has been worth approximately 10-20abp, relative to the surrounding non-affected points along the surface.

Our estimate for the Taiwanese position in USD non-callable credit is ~$235bn. **This is 4% of the HG market and about 14% of the 11+yr maturity bucket**. The Taiwanese insurance industry has been an active and important buyer of HG credit for several years. For context, their stock of long-end holdings in regular-way corporates is comparable to large U.S. life insurance companies[4]. Their activity overnight has been an important driver of US bond trading trends, particularly in the long end. **Since the end of 2013 we estimate that the Taiwan life insurance industry has added $100bn of non-callable USD credit, mostly in the long end, roughly 13% of net supply over that period.**

A discussion of the risk posed by the Taiwanese buying includes the risks if they no longer add to their positions and if they were to look to reduce holdings. If there were evidence of less buying then it is likely that the USD 10s/30s spread curve would steepen, given the share of the long end which Taiwanese insurance companies have typically bought over the past few years. Primary market supply would tend to adjust over time to this, but spreads would likely be wider for a while. The extent of the steepening would depend on the trend in UST curves and equity markets. This is because the US pension fund industry would be likely to add exposures in 30-year bonds if UST yields are higher and/or equity prices are higher.

If the Taiwanese insurance industry were to look to reduce exposures the impact on HG bonds, particularly the long end, could be significant, owing to both the estimated size of their holdings and liquidity in the long end. Over the past year, the average daily trading volume in long end bonds has averaged approximately $6bn/day. Compared to their current estimated holdings of $235bn it would take a considerable amount of time for the market to absorb even a small reduction in their portfolio – and this would result in wider spreads.

To a lesser but still significant extent, Taiwan is a key driver of demand for agency MBS. Unlike volatility and credit markets, however, this is driven primarily by the official sector. Over the past five years, their holdings have grown from $140bn to more than $260bn, or a pace of roughly $25bn/year. This makes Taiwan the second largest foreign holder of agency MBS (**Exhibit 10**). Adding in reinvestments, this translates into gross monthly buying of roughly $4-5bn, a significant and steady positive technical for agency MBS. **Gauging the extent of the disruption a pullback would cause is difficult, but any potential for events related to the life insurance industry to curtail that flow could put material cheapening pressure on mortgages**. This would likely be exaggerated by the associated spike in volatility, given the short vega exposure: a ~10-20 abp rise in long-dated volatility would be worth ~15-30 ticks.

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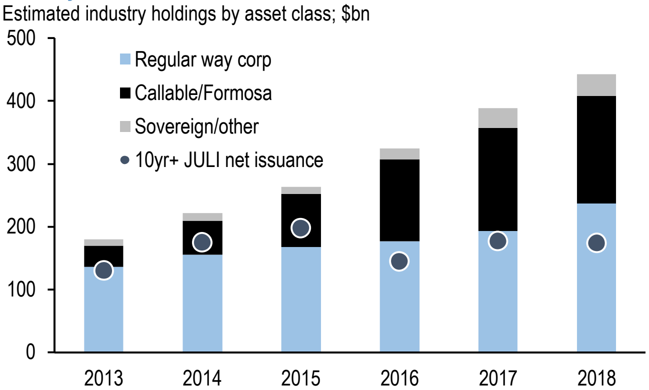
[4] Based on NAIC holdings data, including the 25 largest U.S. insurers representing roughly $1bn in corporate bond holdings, 26% of which is 20+ years remaining maturity.

Perhaps most surprisingly, any significant disruption in Taiwan could affect implementation of monetary policy in the U.S. Though in the pre-crisis days of scarce reserves, the Fed funds market was quite active, deep, and liquid, that is clearly no longer the case. Several QE programs have vastly expanded the monetary base, such that most banks, particularly the largest institutions, have little need to borrow, while increased intermediation and balance sheet costs inhibit their ability to lend. As a result, the Fed funds market has devolved into essentially a one-way flow of FHLBs selling to foreign as well as smaller and regional domestic banks. Among those institutions, **Taiwan has occupied an increasingly large role, participating in roughly 12% of the overall volume, and more than 40% of foreign bank activity, in Q4 2018** (the largest such buyer; see also Interest Rate Derivatives, *US Fixed Income Markets Weekly*, 3/8/19). Interestingly, there is reason to believe their activity is at this point driven more by a desire to source cheap USD funding for lending via the cross-currency basis (see Interest Rate Derivatives, *US Fixed Income Markets Weekly*, 9/28/18). **This suggests that any increased need for USD funding on behalf of the life insurance industry in Taiwan could put upward pressure on the effective Fed funds rate**—itself potentially an argument against the current policy implementation framework (see also discussion in *Altered Rates*, A. Roever et al., 4/10/19).

Exhibit 10: The Taiwanese life insurance industry has been an important buyer of long end HG non-callable corporate bonds in recent years

Estimated industry holdings by asset class; $bn

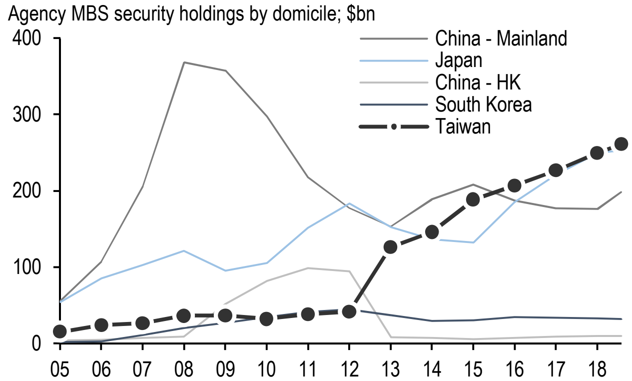


Note: See Exhibit 8 for methodology details.

Source: J.P. Morgan, company disclosures, Haver Analytics

Exhibit 11: Taiwanese Agency MBS holdings have increased at a steady pace since 2013, making it the second largest foreign holder of these assets

Agency MBS security holdings by domicile; $bn



Source: J.P. Morgan, TIC

In summary, our aim in this discussion is to outline some factors related to Taiwan that could drive U.S. fixed income markets going forward. As mentioned above, we do not believe these risks are imminent; rather, they are low probability, tail events. Given their large potential impact across a range of asset classes one might not intuitively associated with Taiwan, they are, in our view, worth quantifying and considering.

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