



Retail Investors – The Largest Player in the Room

A history of ART, and the future role of China & Crypto



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Retail investors – the largest player in the room

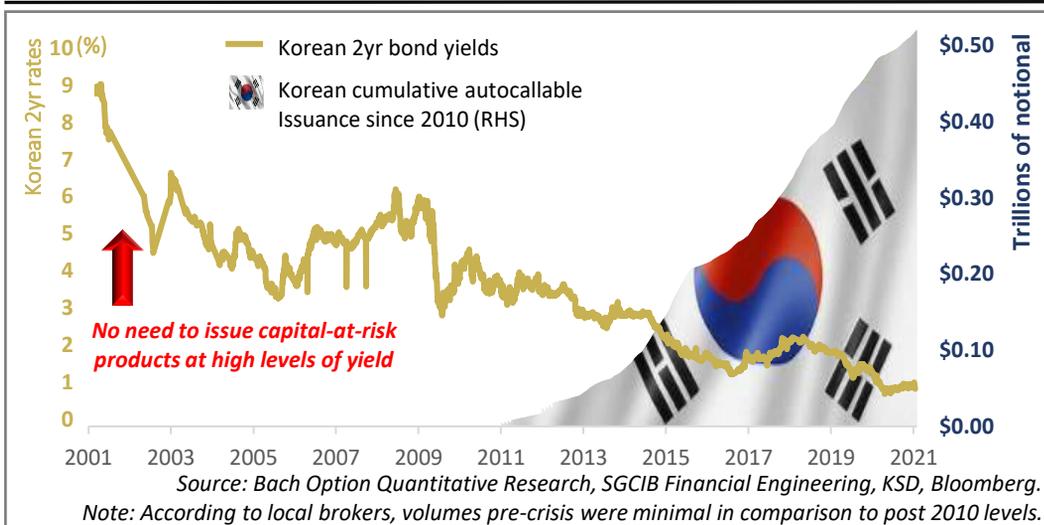
“**W**hat do Greek people call Greek salad?” Answer ... “salad” ¹. The simplicity of the answer to one of our favourite interview questions is often lost on junior exotic traders, especially immediately after debating third-order derivatives with them. And whilst there are certainly complex mathematics associated with managing the Greeks of retail structured products (RSP), it is important to remember that other simple concepts like sentiment, psyche and yield are even more critical to your overall understanding. It may have taken until 2021 and the prolonged effects of Whiskey-Foxtrot-Hotel’ing (aka working from home) coupled with plentiful idle cash, for retail investors to bully the front end of volatility (or gamma) markets, but they have been influencing the longer-end (or vega) markets for as long as most investors can recall. Several factors contributed to this, however, the ever-shrinking yield on offer from fixed income instruments, and the impact of post-crisis financial regulations remain the key drivers. In this paper we will provide some historical context, detail the evolution of trends in RSP issuance, discuss the expansion and subsequent contraction of the associated alternative risk transfer (ART) business, as well as conduct a postmortem on the apparent ‘death’ of what became the largest relative value trade in equity derivative history, originally as a consequence of an RSP-risk recycling frenzy. We will then address why we believe retail investors in aggregate increasingly deserve to be considered: “*the largest player in the room*” before finishing with some perspectives on the future of retail, which we believe is certainly China, and might just be Crypto too!



Devoid of yield the Asian retail structured product market explodes

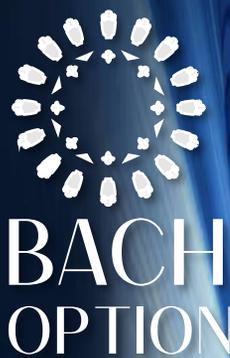
RSP’s in their most basic form are simply bond-like structures that attempt to pay a sufficiently compelling yield over and above risk-free government bonds. In the late 1990s Korean deposit rates were in double digits, and in the past twelve months they have traded sub-1%. It is precisely this loss of risk-free yield which drove bond substitution – in the form of autocallable note issuance – to the tune of US\$1/2trillion notional (equivalent to c.\$2.5bn of vega supply) over the past decade (figure 1). This rapidly shifting dynamic post-crisis, alongside several other contributing factors, allowed Korea to dethrone Japan as the largest RSP player globally.

Figure 1. Rapid reduction of risk-free rate sees Korea become the largest RSP market globally

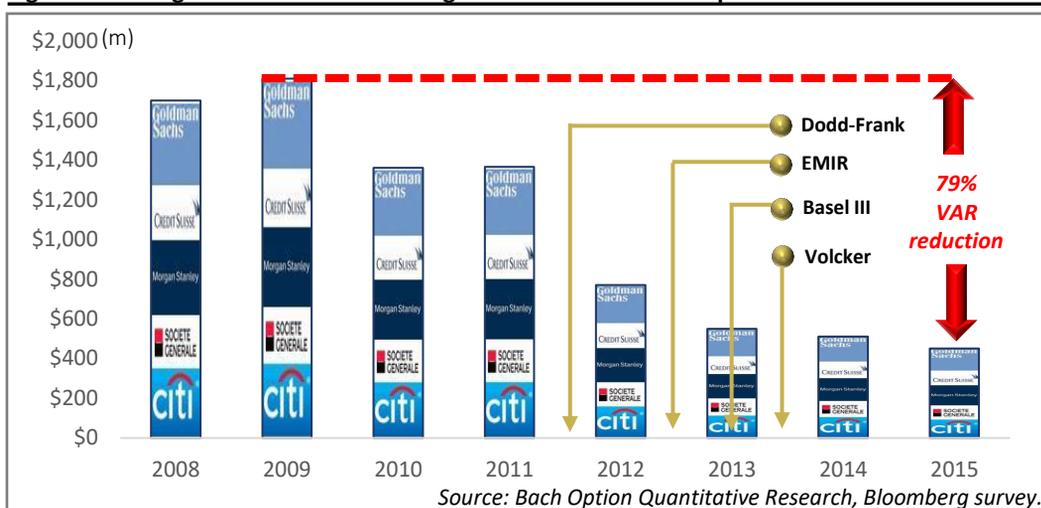


Meanwhile from a regulatory perspective, we witnessed the successive introduction of Dodd-Frank, EMIR, Basel III and finally the Volcker Rule. This dismantled sell-side proprietary trading desks, and enforced substantial increases in capital buffers, reducing aggregate value at risk (VAR) of investment banks by 79% from the peak (figure 2). The adoption of the Volcker rule effectively meant that banks no longer had the capacity, or critically the discretion, to warehouse the sizeable risks coming from RSP on their balance sheets, which unsurprisingly had huge implications for vol surfaces, especially where there was no natural offset for such risks.

¹ Akin to “what do Chinese people call Chinese food?” N.B. an alternative acceptable answer is “Horiatiki”. 2



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Figure 2. Average total summed VAR of global investment banks post-crisis

In order to remain relevant in the RSP business, banks needed to demonstrate to distributors their capacity to facilitate the continual issuance and re-issuance cycles of these structured products, in addition to placating regulators. Banks were therefore forced to actively locate new hedging partners, and a multi-billion-dollar alternative risk transfer (ART) business was born.

Death of a (Prop) Trader-man

In the late 1940s, the playwright Arthur Miller gave us the 'Death of a Salesman', and in the aftermath of the GFC, former Fed Chair Paul Volcker, inspired the 'Death of a Trader-man' (and Trader-woman). Despite the April 1st launch date of the Volcker rule back in 2014 – or as it more formally known: section 619 of the Dodd-Frank Wall Street Reform and Consumer Protection Act – this was no fool's joke. Implementation rules were finally set forth to ensure that banks complied with section 13 of the 1956 Bank Holding Company Act, thereby effectively prohibiting use of their own account to take proprietary positions. Just like Miller's protagonist Willy Loman, proprietary traders may have had their issues, and some historical critics have also called them delusional, but it does not make their demise any less of a modern-day tragedy. For all the heavily publicized failings of a select few, the vast majority of proprietary traders were not morally-bankrupt maniacs constantly trying to hide their positions from risk managers, but in fact played an incredibly important role in ensuring the integrity of markets, especially in times of extreme turmoil.

Indeed, it is our view that the consequences of the decision to disband prop desks will only be fully revealed during the next crisis. For all the technological advancements of quant market-makers, and for all the hedge funds launched out of multiple legacy prop-trading arms (Goldman Sachs Principal Strategies, JP Morgan CIO office, Lehman Brothers Prop etc.); successfully recreating that liquidity provision profile remains elusive. In years gone by, prop desks acted as non-governmental liquidity providers of last resort. Backed by bank' balance sheets, and not beholden to monthly redemption schedules – if well managed and appropriately Chinese-walled – due to their substantial appetite and tolerance for risk, prop desks were able to step in to stressed situations and take the other side of trades that no one else could, providing the market with liquidity when it needed it most. Moreover, unlike central banking liquidity provision, prop desk liquidity did not create any moral hazard for the public at large. This abrupt removal of trading desk's risk-managing discretion, however, meant that not only would there be limited liquidity provided in stressed market environments, but also the day-to-day facilitation of sizeable client activity became extremely problematic, as best efforts would need to be made to hedge the full clip size of any risk at inception. This was especially challenging for less liquid Asian indices such as HSCEI. It was important to monitor the aggregation of risk in RSP in the past, but post-crisis, we cannot stress how critical it became to analyse these flows in depth and in real-time. Ultimately, as a function of the fruitless hunt for yield in bond markets, RSP issuance started to explode exactly at the time when banks could no longer efficiently manage that risk, which is why vol surfaces (and dividend term structures) became so artificially distorted.

A brief history of ART

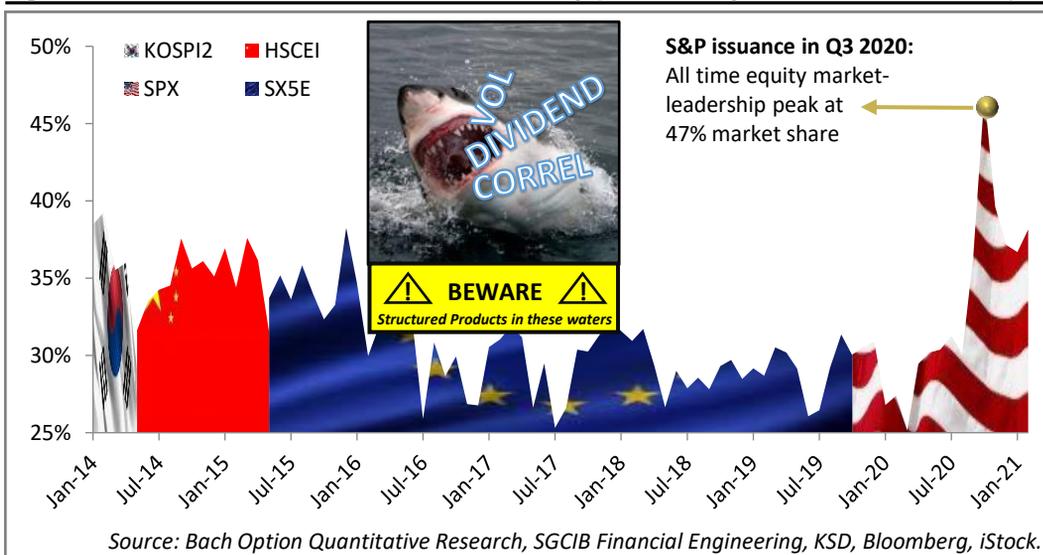
When we attended college, there was no finance class on 'the history of ART'; that is not to say that alternative risk transfer, or ART, did not exist, but it was only post-crisis that the necessity, scale and breadth of the business changed so dramatically. Between 2014 and 2020 ART's pervasiveness was so great that several bank's setup dedicated ART facilitation desks. Managing ART positions was not only popular at established hedge and pensions funds but instigated the launch of entirely new funds. At the peak of ART there were over a dozen strategies that were

Figure 3. The active ART tradable product-set



regularly trading (see graphic in figure 3.), and because of the nature in which these retail products are constructed, the risks are not limited to equities either. In addition to autocallables referencing mutual funds and U.S. yield curves in recent times, even the traditional offering creates broader risk impacts because they are ordinarily priced as quanto products, meaning that the price is made, and the profits are paid, in local currency (e.g. KRW & JPY), whilst referencing an underlying denominated in a foreign currency (e.g. HKD, EUR & USD). Moreover, the risks are further complicated by the increasing preference for multiple underlyings in 'worst of' baskets. Thus, in addition to the typical exposures we would expect to see from vanilla derivatives, autocallables also generate correlation, covariance, as well as FX and rates vol risks that are not always easy to hedge. Whilst there may be an incredible breadth to the product-set of ART, at any given stage, depending on the prevailing coupons and levels of bullishness of retail clients, one will find that autocallable issuance is heavily concentrated in certain countries, which is why there is always the potential for risks to overpower individual markets, especially if the accumulation phase goes uninterrupted for a meaningful period of time. It is therefore critically important to follow country index issuance-leadership trends as represented in figure 4:

Figure 4. RSP index issuance market share-leadership (based on representative Korean data)

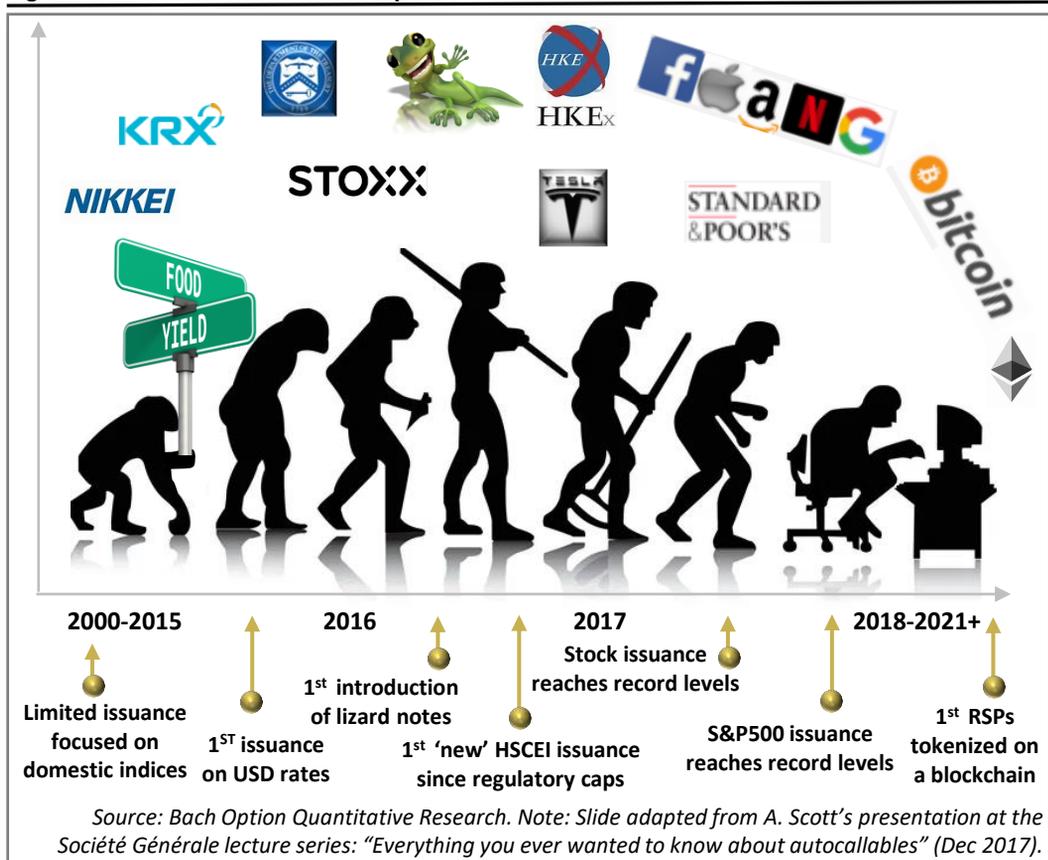


Prior to 2014, domestic indices were consistently 40% of total issuance in Korea, after which the HSCEI assumed leadership, achieving record issuance levels until the Chinese equity melt-down and regulator-intervention during Q3 of 2015. HSCEI then spectacularly lost its number one spot to the Eurostoxx for almost four years before issuance leadership finally shifted rather emphatically toward the S&P in 2019, where it remains and grows to this day.



Each one of these mini cycles of leadership tells a significant story: from the explosive vol moves in HSCIE in 2015 as banks desperately bought back hedges, to the huge build up of Eurostoxx epsilon/dividend risk, which reportedly left a US\$500m-sized hole in the P&L of sell-side trading books, as European corporates', in an unprecedented move, cancelled pre-announced dividends during the pandemic last year. Given the large exposure to the forward in an autocallable, banks end up with large exposures to dividend streams, and this position grows even larger when markets fall hence the magnitude of the losses incurred. However, given the immense complexity regarding these products, the impact is sometimes more subtle. For instance, one may observe a periodic bid to long-dated Korean Won currency volatility during equity sell-offs. This is not so intuitive until one recalls that these are quanto products and in such constructs, not just the price, but the profit or loss must be paid to the end-Korean retail client in Korean Won too. Since 2014, autocallables increasingly referenced international underlyings, denominated in any number of currencies such as the HKD, USD, or EUR. Therefore, as the investment bank must hedge the mark-to-market of these cashflows, and the biggest driver of the P&L in the structure is the equity index delta, this FX exposure grows most significantly when equity markets are selling-off. Through this quanto correlation, trading desks not only have an implicit short exposure to the FX volatility of the foreign currency the referenced equity market is denominated in, but also bear a correlation exposure between the foreign currency and the KRW. To manage this piece of the hedging-puzzle, banks thus need to purchase volatility in HKD/KRW, USD/KRW and/or EUR/KRW FX pairs, and since this market is not particularly liquid beyond the 1 and certainly 2 year maturity buckets, it can create quite a significant distorting effect upon the term structure of FX volatility. Indeed, although the first RSP was issued as early as the 1990s, it is important to appreciate that diversity of country and product type is really a fairly recent phenomenon (see figure 5. below):

Figure 5. Evolution of RSP issuance product trends



Unprecedented distortions created by Peak Vega

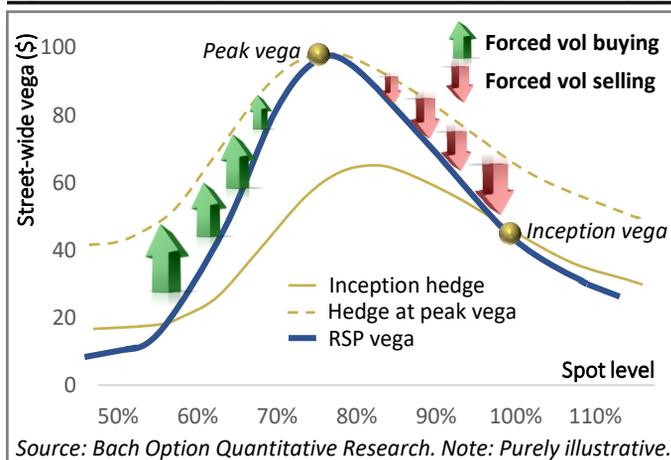
Historically, the overwhelming bias of autocall issuance was in mono-form, referencing a single global index from a limited selection of choices. As vol levels collapsed, ergo coupons offered fell, a broader set of indices and more single stocks started to increase their share of issuance.



It was this build up of record single stock issuance (especially originated from Japanese private auctions and), heavily focused on mega-tech in North America, alongside record S&P500 index issuance that generated such confusion at the end of 2018, when single stock and index skew performed so very differently. The sell-off that ensued was very much a Nasdaq-biased unwind, and this concentration of selling accounts to a large extent why such wild distortions in the clearing price of volatility/skew occurred. Many large-cap tech stocks subsequently traded through, what the industry refers to as their respective 'peak vega' level, and hence single stock vol surfaces experienced substantial forced vol buying from investment banking trading desks (as they scrambled to buy back hedges), whilst the S&P drawdown was not nearly as severe, meaning that banks' were actually still net-sellers of index volatility over the same period.

This concept of peak vega is a little challenging to grasp at first, but we cannot stress enough how critical it is in understanding of volatility price action, especially in extreme market sell-offs. Peak vega represents the greatest sensitivity to volatility on all RSP positions at an aggregate 'street-wide' level. As the underlying sells off to peak vega, the vega risk on the structured product rises more rapidly than on the vanilla hedge. But once the threshold is passed, and we

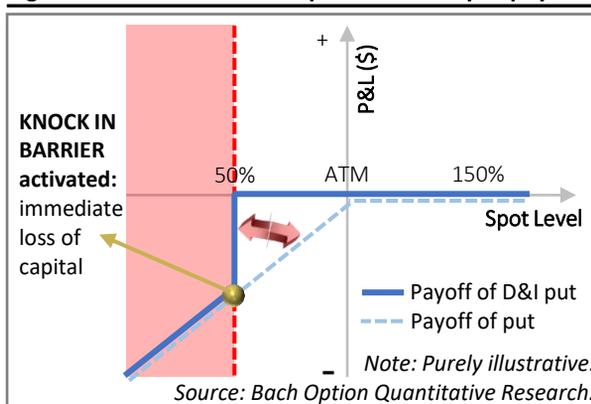
Figure 6. Inflection point where vol selling flips to vol buying



Source: Bach Option Quantitative Research. Note: Purely illustrative.

trade below peak vega the possibility of the product no longer existing, i.e. becoming a very deep in the money put starts to increase. This means the prospect of having a very low vega exposure in turn grows. Essentially at very high spot levels the vega is zero (because the product will be called), and at very low spots the vega will be close to zero (because it more closely resembles a delta one product than a vol product) and it is exactly because of this dynamic, or more precisely the differential in the vanna deformation ($dVega_{dSpot}$) between the RSP and the vanilla hedge that creates hedging difficulties (figure 6)². Therefore, as the RSP vega collapses on the downside, banks need to buy back more vanilla positions that they previously sold as their hedge. Accordingly, peak vega – or rather 'plateau vega' since it is more of a mini-range than a precise point – more practically represents the inflection point at which banks switch from being forced vol sellers to forced vol buyers in maintaining hedged-RSP portfolios, and this attachment point is typically around -30% from the prevailing spot level at issuance.

Figure 7. SHORT down & in put vs. vanilla put payoff



Note: Purely illustrative. Source: Bach Option Quantitative Research.

For a more visual appreciation of why the vega changes more abruptly on a RSP, consider the payout on the embedded down and in put. If you are unfamiliar with the option components of a RSP or wish to be reminded, please refer to the appendix for a mini primer on the basic structure of autocallables. In this paper we only describe the salient features of relevance to the discussion, but if you want to learn more, please reach out to us at: IR@BachOption.com. As is clear from figure 7., compared to the normal disc-

ontinuous payout of a vanilla put option at strike (think 45-degree angle hockey stick), the scale of non-linearity in the structured product is much more significant, since you experience an instantaneous jump at the barrier, rather than a gradual shift as per the vanilla.

² N.B. hedging is yet further complicated if we consider the effects of vomma ($dVega_{dVol}$) and cross-gamma. 6



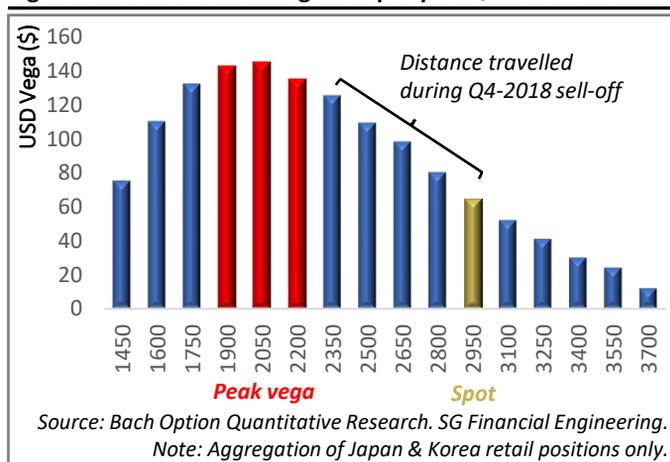
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Similarly on the upside, and whilst it usually does not create any meaningful hedging difficulties because the associated vega is much smaller, if a RSP is called, upon breaching the upside knock-out barrier, once again an abruptness in the vega-shift is felt. But this time it is not as a result of any capital impairment but rather because below the barrier the product existed and above it, it does not.

Following large improvements in the transparency and the overall quality of RSP data-sets in the past few years, it is increasingly feasible to guesstimate the approximate peak vega level in the largest equity markets. Returning to our earlier example, one of the best estimates for S&P peak vega at the end of 2018 placed it around 2,050.³ At -20%, the S&P sell-off from a 2,940 peak to a 2,346 trough was simply insufficient for the hedging activity to inflect (see figure 8 for key trigger points). Therefore, this substantial selling pressure on vol remained consistent throughout this period, ensuring that index skew was kept extremely stable and in check. Such price action had never previously been witnessed: until this moment no 20%+ sell-off in the history of U.S. equity indices had ever been experienced without a reciprocal pickup in convexity. Causing yet further confusion, was the simultaneous blow-out in single stock skew. During this same sell-off, high-flying stocks like Netflix and Facebook suffered peak to trough drawdowns well in excess of -40%, placing them firmly to the left-hand side of peak vega levels, and exposing their much less liquid vol surfaces to forced vol buying from multiple investment banks.

The size of the hedging activity both on index and on mega-tech names was so large because in the previous 18 months there were optimal conditions for a build-up in issuance, ergo outstanding vega: rising sentiment / markets and increasing vol / coupons. For all investors, whether they were cognizant in real-time or not, this was one of the first examples of the dominating role now played by RSP's in U.S. vol markets. For more granularity on this specific event please refer to Scott's 2019 paper "EQD EXPLAINER: Deconstructing American Smiles" (Société Générale CIB).

Figure 8. Estimated RSP vega vs. spot pre-Q4 2018 sell-off



ART financial engineering in the beginning was focused on decomposing autocallable risks into as many components as possible, in order to increase the efficiency of the banks' hedge. However, it quickly became less of a scientific endeavour and more of an art form. Simply because a bank offered a product at a discounted price did not guarantee a receptive audience, and thus banks' needed to innovate at the expense of efficiency. The art of ART was, and still is, a fascinating balancing act, between meeting the needs of the trading desk, the bank's credit team and the end-investor. The risk transfer product must appropriately hedge the underlying risk, and since 100% of ART is over-the-counter it is subject to counterparty risk, a befitting level of margin must be charged without disincentivising the transaction, all of which concern a product that may have no trading history. Finally, perhaps the hardest part of all, is to create a feasible macro narrative regarding why the trade idea makes sense and would make money in the first place, whilst also offering a competitive price to ensure you actually win the trade. Ultimately much of the value in this type of ART, is not in the eye of the beholder, but is found in the scarcity factor. Widespread adoption typically shrinks margins for both banks and their ART clients. At its best, ART can be win-win-win for investment bank, institutional client and retail client (since it facilitates the ability to issue more RSP) and is usually the result of a large amount of transparency, trust and partnership. But at its worst, it can be incredibly opaque, easily mispriced and carry career-risk. There is perhaps no greater example of a trade that experienced such spectacular success and then failure, than the Asia over U.S. variance swap bets, which became the largest relative value (RV) trade in equity derivative history and is assessed in detail in the following section.

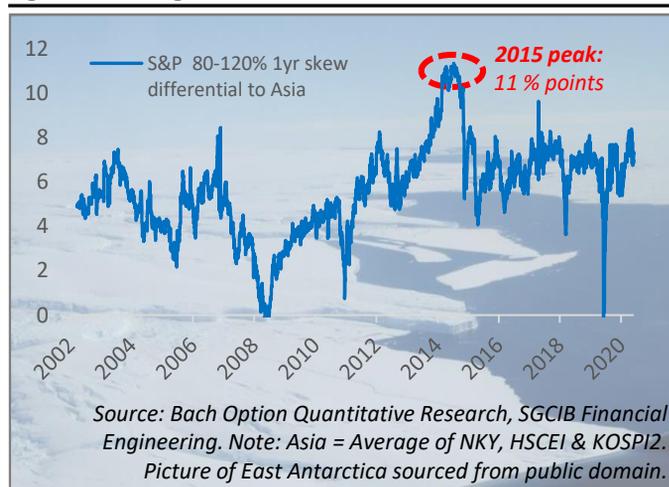
³ Data from Société Générale CIB Financial Engineering's monthly RSP overview (peak vega size = \$200m). 7

Fundamentally unstable volatility surfaces

Like the glaciers of East Antarctica, the vol surfaces of Asia are fundamentally unstable! As a consequence of the inception hedge of an RSP becoming largely immediate and formulaic, there exists a permanent structural seller of vol and skew with no natural offset in Asia. As a reminder, the typical hedge for a traditional autocallable would see the bank sell an 80% struck put at a maturity matching the duration of the issued product.⁴ Note this is what we call the static inception hedge since it requires continual re-hedging. As explained, until we reach peak vega, banks will continue to sell vol as spot falls, and in the event of a rally the product will be automatically called (hence the name), meaning banks need to buy back their hedge; creating this unusual positive spot-vol correlation and depression of skew. Unlike Commodity or Crypto markets, negative skew (i.e. when downside vol is priced higher than upside vol) is generally a consistent feature in equity markets for several reasons, but at a fundamental level the fact that a stock is meaningfully lower, *ceteris paribus*, creates an instantaneous rise in the debt-equity ratio rendering the stock a theoretically riskier entity. Forced hedging activity of RSP in Asia, therefore to some extent distorts this premise. Meanwhile, in the U.S., the opposite structural trend prevails, here there is a permanent bid to vol and skew as large insurers are natural buyers of downside as a function of their hedging needs arising from large variable annuity books, in addition to the existence of a substantial institutional overwriting community selling the upside.

In 2015 we saw the peak in this skew imbalance, with the S&P 80-120% skew trading almost 11 percentage points richer than the average large-cap Asian index (see figure 9.), despite at the money (ATM) vol in the S&P trading at an average discount of 4 points. This subsequently led to the accumulation of the largest relative value trade in equity derivative history: long Asian index variance vs. short S&P500 variance.

Figure 9. Average US skew richness over Asian indices



LONG Asian index variance

vs.

SHORT S&P500 index variance

The rise and fall of the largest relative value trade in equity derivative history

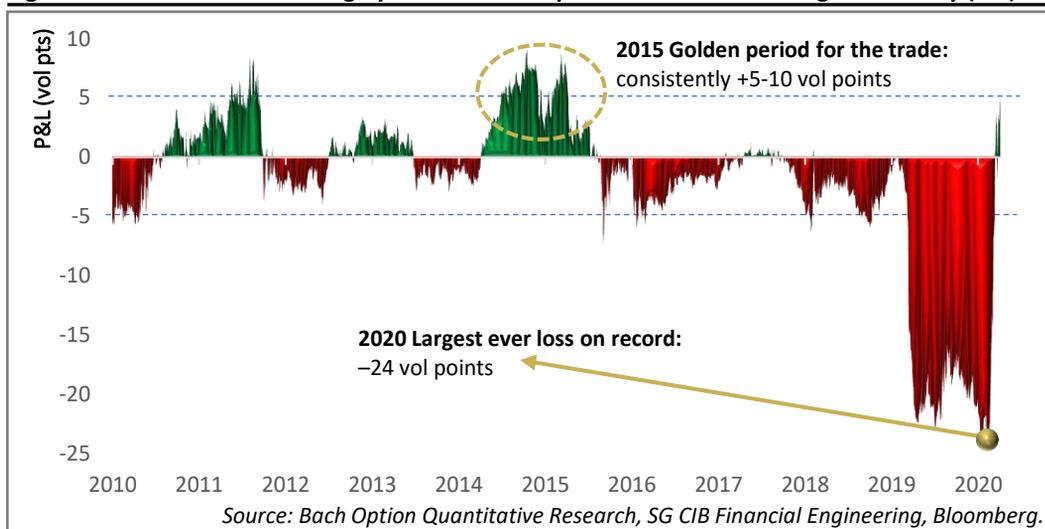
There are very few, if any, vol or macro funds globally who at some point did not have risk allocated to this trade. At its peak, in all formats, estimates of the total trade size range from \$1-1.5bn gross vega notional (i.e. \$500-750m in the Asian leg).⁵ For reference, the largest outstanding autocallable vega risk ever accumulated in Asia was about \$400m, and so at the height of its popularity, the 'recycled' risk in this trade, was considerably in excess of the underlying risk it was supposedly hedging. In 2015 investors began the year reasonably constructive on China, imminently expecting an announcement on MSCI Emerging Market index inclusion and the heightened volatility of this index versus regional peers meant that this autocallable coupon was by far the most attractive. Such was the consistent leadership of HSCEI issuance heading into the China equity market capitulation that 80% of all outstanding 'worst-of' equity-linked notes in Korea were referencing the index. Unsurprisingly in the hedge fund community long HSCEI variance over the S&P also became very popular given bank's need to offload their risk in order to issue more.

⁴ For simplicity at this stage we have ignored the requirements of also risk-hedging delta, rho etc.

⁵ FYI representatives from Société Générale, BNP Paribas, Morgan Stanley & UBS were surveyed.

Then during the nigh-on halving of the Chinese equity market that same summer, the position performed phenomenally well, thereby encouraging even greater interest in the trade (figure 10). From a pricing input perspective this RV trade wonderfully captured the extremity of the structural distortion: short the artificially overpriced tail in the U.S., as well as long the theoretically underpriced Asian leg, leading to very compelling entry levels.

Figure 10. Historical P&L of long 1yr HSCEI var swap vs. short SPX & holding to maturity (1:1)



However, like all proxy hedges, there was a mismatch in the greek profile and the larger the risk grew the more it was magnified. Thankfully, the market evolved and over time the cross-corridor var swap was pioneered to address part of these hedging concerns, and this was the moment when volumes really started to explode. Essentially this trade more neatly matched the path dependency of the autocallable risk profile for banks' and gave investors an even more favourable entry level in the case of some pairs. Recall at higher spots the RSP no longer exists, and at much lower levels the structure knocks in, rendering the product a deeply in-the-money put with a higher duration but limited greeks (namely minimal vega). Therefore, in order to capture this boundedness of the RSP risk, in corridor format, variance is only calculated if the Asian index remains in a given spot range. As a function of this structure, at one point during 2016, the pricing inputs were so favourable that it was possible to own Asian vol against S&P vol and get paid for the pleasure. A full mathematical explanation of the corridor pricing is beyond the scope of this paper, but suffice to say, there are great complications associated with managing barrier products, since second order greek risks, such as vanna ($dVega_{dSpot}$) and vomma ($dVega_{dVol}$) in particular as touched upon earlier, evolve rather differently to their approximated vanilla hedges. This requires careful attention throughout the life of the product, hence the overwhelming interest in the corridor solution.

In every corridor of what felt like every trading floor, there became an unhealthy obsession with corridors. Between 2015 and 2018, money managers the world over, were suffering such debilitating withdrawal effects from the non-medical affliction of 'volatility deficiency disorder' that they were willing to go to great lengths to pick up any extra dose of premium they could find to soothe their pain, and corridor structures at least optically provided this. In fact, the trade became so fashionable that spot ranges were no longer only set at 70-110% (the original logic to match autocallable barriers), but ranges were continually optimized to keep up with investor demand: 80-110, 90-115 and so on. At one point we even saw corridors trade on Asian FX markets, such was the level of comfort reached in the product from macro accounts. This was perhaps the first sign that this trade was being over-engineered. What was not always well appreciated by investors was that by striking the lower barrier at higher spots, they were missing out on one of the most powerful features of all in this trade, i.e. the transition through peak vega. Investors may have been exploiting RSP flows on entry but were no longer taking advantage of the most powerful dynamic of all on exit: the aggressive vol buying into thin liquidity as spots sell-off (refer back to figure 6.).



Beyond the favourable pricing inputs, it is important to consider why the long Asian variance; short S&P variance trade became so popular, because it was just so easy to justify from a plethora of angles: macroeconomic, market micro-structure etc. This is what really encouraged the wide-spread participation by multiple investor types. Indeed, from HKD currency breaks, and North Korean nuclear war, to the expected tapering of Abenomics and US-China trade wars; there was always a macro narrative that rationalized the trade. Moreover, structurally, we not only had a perpetual depressor of implied vol in Asia, but multiple structural quashers of realized vol in the U.S., which was hugely supportive of the trade's actual performance. In the decade post crisis, a very well-defined dynamic developed; which saw the S&P become the biggest buyer of the S&P, as U.S. corporates bought an estimated \$5.5tn (according to Bloomberg data) of their own shares back. To offer some perspective of scale, that is larger than the nominal GDP of the UK, Italy, Switzerland and HK combined last year. In addition, we also witnessed a gargantuan shift from active to passive investment, and Robin Wigglesworth of the Financial Times estimates that the entirety of the passive industry now stands at a staggering \$20tn today.⁶ These powerful forces, backstopped by the Fed, combined to ensure that between 9th Dec 2011 and the 26th Feb 2020 we saw just 9 daily closes of the VIX recorded above 30. And by the 10th March of 2020, what took almost 9 years to achieve, had been experienced again in just 9 days, and the VIX went on to trade above 30 for an astonishing 50 consecutive trading days. What had seemed on paper like the perfect trade – and to be fair, many money managers did successfully monetize these trades – was starting to blow up rather spectacularly.

In reality, it is entirely understandable why so many investors were continually seduced into the short S&P vol trade as it acts particularly bi-modal vis-à-vis Asian vol. For much of the time, U.S. vol realizes very poorly, until it rather emphatically does not. However, a confluence of drivers were moving against this trade for quite some time, and the warning signs kept coming. The VIX blow-up in February of 2018 was an important turning point in this trade, because U.S. equity volatility finally awoke from its slumber, and as the year progressed the focus of speculation in global markets was firmly on America, leaving large-cap Asia as a mere after thought. It is a subtle point, but in a corridor var format there is a very large exposure to delta, and so any sizeable differential in spot moves really punishes the mark-to-market, making it very difficult to continue to carry this risk in the same size as previously. Indeed, the 3 month realized vol spread for HSEI & KOSPI vs. the S&P was frequently in its 1st percentile (8 year window) throughout 2018, meaning that investors were losing on both carry and mark-to-market.⁷ Moreover, the balance of structural players was also shifting, and in 2019 for the very first time ever, the vega risk generated by RSP referencing U.S. underlyings exactly offset the outstanding volatility exposure of North American insurers' sizeable hedging programs, just north of \$400m of vega. What was happening in plain sight but in slow-motion was a dramatic product redesign of the variable annuity (VA) business.

While individuals invest in RSP to boost short-term income streams, many of these same investors use tax-deferred annuities within a life insurance wrapper to boost future income, typically as part of their retirement strategy. The most common types of annuities, until recently at least, were either fixed or variable. In terms of relative risk, fixed annuities, as per the name, offer a fixed payment stream at a predetermined point in the future, while VA's offer potentially higher (but variable) payouts, and unsurprisingly carry higher risks. Since the early 2000s, investors have continued to travel up the risk scale into VA products in search of higher payouts. These products create significant demand for vega hedging as a result of the very long-dated (sometimes 40+ years) nature of the guaranteed minimum benefits associated with the offerings. Practically, these guarantees mean that policyholders essentially own a put option with maturity matching the end of the accumulation phase, and a strike equal to the present value of the annuity at expiration, thereby exposing insurers to a sizeable short embedded put/vol position. The most popular guaranteed minimum benefits offered are death (GMDB), accumulation (GMAD), withdrawal (GMWB) and income (GMID).

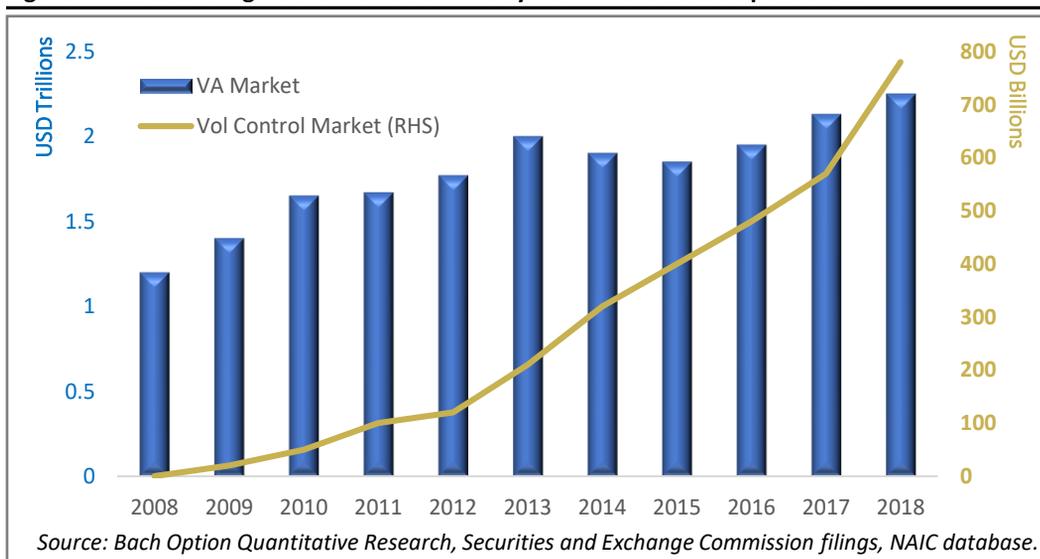
⁶ Wigglesworth, R. (2021). "Trillions". Penguin Random House.

⁷ According to Deutsche Bank data.



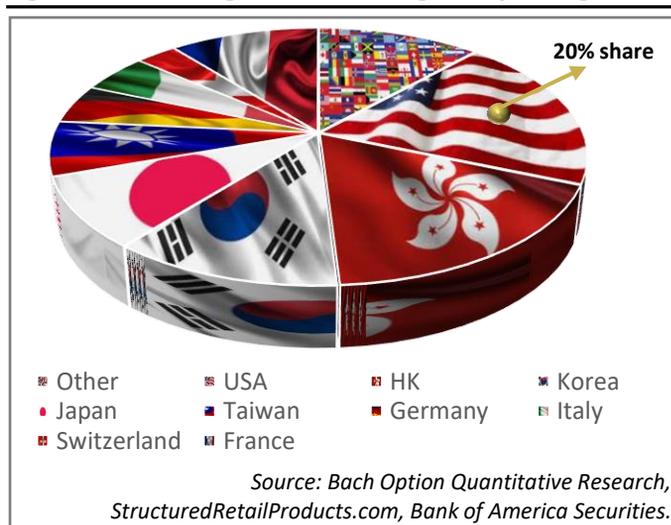
Moreover, exactly like RSPs have unknown durations due to the callability risk, and mortgage-backed securities have prepayment risk, similarly insurers face uncertainty over the exact maturity profile of their portfolios since they are exposed to mortality and surrender risk. Death, for instance, effectively triggers immediate early exercise of the embedded option. Insurers historically hedged these guaranteed risks (liquidity-permitting) with futures, puts, put spreads and variance swaps⁸ based upon a bespoke actuarial assessment of their specific book of business. Hedging is complicated even further by any additional introduction of the following features: a level of principal protection, a rising floor, or a ratchet/lookback. However, after a full-blown existential reckoning for the industry during the GFC, it was clear that these products needed to be redesigned. And even pre-crisis, in 2007 Prudential already launched the first dynamically allocated portfolio, which was quickly followed by AXA's first vol managed fund. By 2011 MetLife made vol managed funds mandatory in elections and by 2014 AIG explicitly linked the fee structure of their products to the VIX. Whilst the overall VA business had doubled, in excess of \$2.2tn, the composition changed substantially. The products had shorter durations and more vol risk was passed to policy holders at source. This meant that there was much reduced demand from insurers for vol and by 2019, 70% of all new business (\$750bn worth of notional) was now in vol managed funds (see figure 11). In the early 2000s and indeed earlier, one had only ever seen demand for long-dated US index vol and now the situation had completely flipped.

Figure 11. Outstanding insurer Variable Annuity AUM in the decade post-crisis



Rather stealthily, this had become a seminal moment in the acknowledgment of the overwhelming power held by retail investors in global vol markets. They had influenced the term structures and smiles of Asian markets for decades, but suddenly retail investors had become the largest incremental driver of U.S. vol surfaces too. These investors were also no longer exclusively Asian-based either, but on home soil as well. As figure 12 depicts, for the first time the U.S. leads global market share in outstanding RSP issuance.

Figure 12. Share of global outstanding RSP by issuing country



⁸ For simplicity we entirely focus on the equity argument here, purposefully ignoring swaptions & credit risks. 11



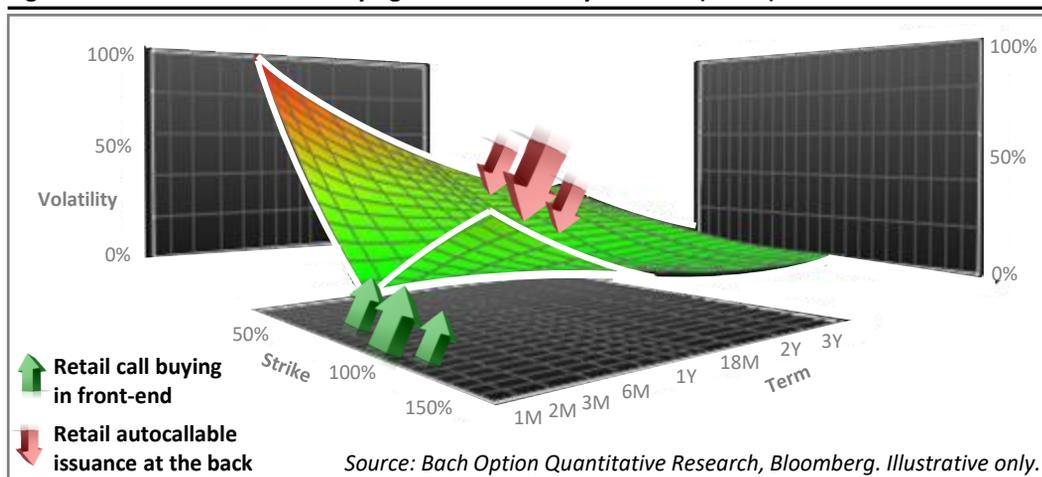
Meanwhile, as 2020 progressed, the artificial stability created by several structural vol-quashing dynamics started to fade, just before the pandemic provided the final nail in the proverbial coffin of the largest RV trade in equity derivative history. The assumption that Asian vol would always trade at a higher beta to the U.S. in global sell offs was fundamentally discredited. Other ART products and several talented hedge fund managers also fell victim. However, almost unbelievably, retail investors escaped 2020 practically unblemished. Just as in 2015, when retail investors were caught up in the 50% Chinese equity market drawdown, extremely few products were ever unwound, or restructured. And since the average duration of the RSPs that were then turned into vanilla puts (following the knock in event) was over 2 years, hardly any retail investors experienced material capital losses as Chinese equities continued to recover through 2016 and then 2017. Similarly but even more spectacularly over a shorter period of pain, in 2020, U.S. markets recovered so quickly that there was almost no time to make an informed decision on unwinding/restructuring RSP positions before capital losses were entirely recouped. In fact, peak, to trough, and back to peak again, happened inside less than 6 months (see figure 13).

Figure 13. S&P500's unbelievable price action during 2020



Retail investors may not be feeling good about life in general but, they are feeling great about their investment portfolios. Throw in stimulus checks, the prolonged effects of working from home for so long and it is no surprise whatsoever that Robin Hood and Coinbase have reached almost 100 million accounts combined. Backed by performing portfolios, government bailouts and millennial's desire to achieve financial security: retail will exit this crisis an unstoppable market force. Lifting the front-end of vol markets through their use of tactical leverage and depressing the back-end in their hunt for yield (see figure 14). This is exactly why; we believe that retail investors increasingly deserve to be considered "the largest player in the room!"

Figure 14. Retail investors' "bullying" of U.S. volatility surfaces (in 3 D)



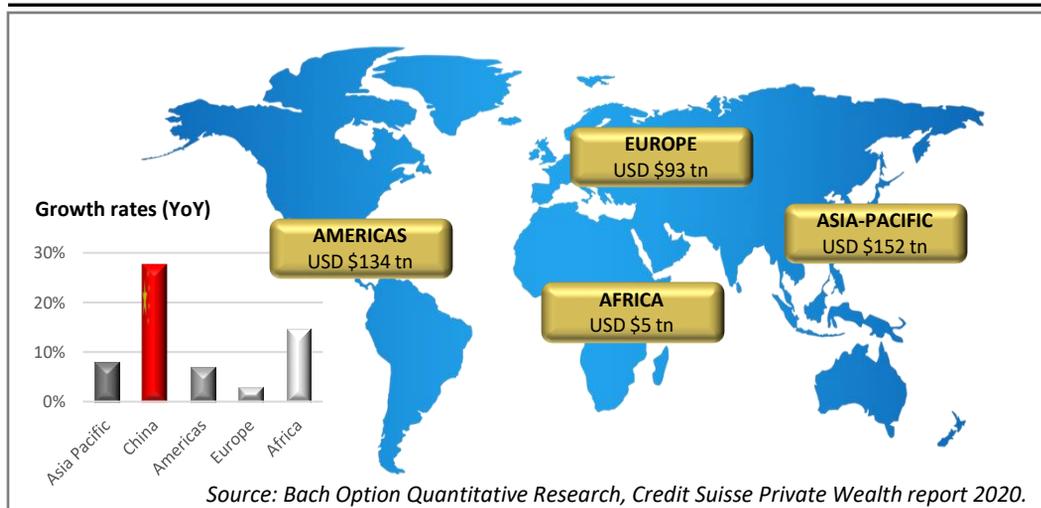


The future of retail: the role of China & Crypto

U.S. equity markets have rallied almost 6-fold since the crisis and with growing acknowledgement that inflation-adjusted bond returns are almost guaranteed to lose money, there is unsurprisingly desire to diversify private wealth portfolios in North America, which is why we witnessed some of the largest RSP volumes ever recorded in this region in the past 18 months. However, in the short-term, we expect Korean issuance to reassert its multi-year dominance and given the persistently high levels of skew in U.S. equity markets, we think the geographical bias of underlying selection will remain U.S.-centric, with a healthy allocation going into single stocks. This in turn will continue to support the active dispersion business, an area that we at Bach Option spend a lot of our focus and energy on. Indeed, we have high hopes for dispersion: not only is there constant leadership changes at a sectoral and factor level now, but there is also a pickup in idiosyncratic noise as a function of the reddit and wall street crowd. Having said this, overall volumes could be on the lighter side, if rates continue to rise, since there will be renewed emphasis on capital guaranteed products. In terms of offsetting these retail flows, there is likely to be limited demand for Asian vol following 2020. Meanwhile, in U.S. markets, while still in their infancy, many insurers (namely Brighthouse, Lincoln, Prudential and Equitable) are experiencing record growth in their Registered Index-Linked Annuities (RILA)⁹ book of business, which may not be presently visibly impacting vol markets, but are already disrupting long-dated forward/repo levels and so should be monitored closely. Finally, with the implementation of the latest FASB accounting rule update regarding the hedging of guaranteed minimum benefits on long duration contracts getting delayed yet again, this time until 2023, absent an active public insurer buying vol in size, the incremental structural driver of vol will continue to be retail in nature.

The total Asia Pacific private wealth wallet reached a sizeable \$152tn last year, having only overtaken North America for the first time in our lifetimes the prior year (according to McKinsey), and so we anticipate that Asia broadly will continue to dominate retail flows, but the individual country drivers of growth will likely change. Going forward, in the new world order, it is unclear how the China and U.S. fight for economic and security dominance will play out, but there is absolutely no competition regarding which country will boast the larger RSP wallet. To our minds, China will unequivocally become the largest RSP market in the world. Granted the form that this ultimately takes, is up for debate because of the complexities of the regulatory backdrop but Chinese dominance is likely to be unstoppable and so if the Chinese authorities truly have ambitions for Shanghai to be a global financial center, they will certainly smooth the path. Whenever there is political will in China, policies change very quickly and given the rapid absolute and relative rates of wealth creation unfolding, it may occur faster than we anticipate (figure 15).

Figure 15. Distribution of wealth among regions (US\$ tn) with select growth rates

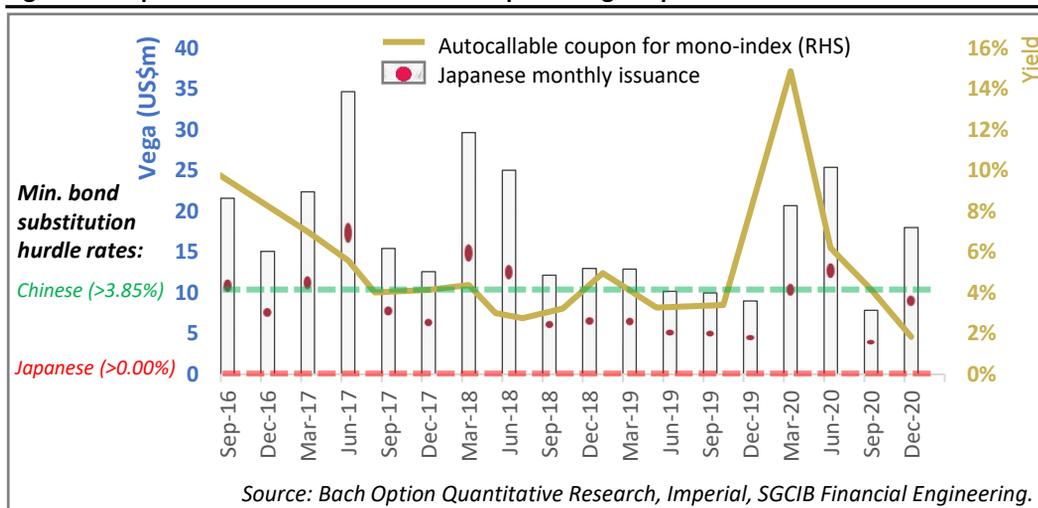


Incidentally, if it were not for the fact that Chinese bond yields are the highest by far across the developed world, this may have already happened. The hurdle rate for RSP issuance is obviously much higher in regions where the domestic bond yield is high, as observed in China, at 3.85%.

⁹ Refer to: <https://www.athene.com/smart-strategies/finances/what-is-a-registered-index-linked-annuity-and-how-does-it-work.html> for a basic overview of the product.

If we consider Japan, for instance, since bond yields are always so low, issuance volumes spike simply whenever coupons are sufficiently high (figure 16), and sentiment is neutral to positive.

Figure 16. Japanese issuance trends based on prevailing coupons available



Therefore, as rates normalize lower in China, we should see greater demand to substitute bond exposure in the retail portfolio. Note this is a section of retail investors that is already extremely comfortable taking on risky corporate exposure, it just happens to be in the form of credit rather than equity today. The historical perception was that credit in China was a safer bet, however, with corporate defaults on the rise this view is quickly changing. Wealth management products in China is already a CN¥30tn industry (c.US\$5tn) but following a sustained government crack down campaign on shadow banking, which is now really taking hold, literally thousands of P2P lenders have already shut, and this mountain of cash needs to be rehoused somewhere. Unfortunately, when an investor becomes accustomed to consistently 10%+ annualized returns, there is not a great alternative opportunity set. International retail structured products consequently begin to look more viable in this context, however, at current levels, the coupons on offer in equity products may not be of much interest until there is greater acceptance of persistently lower rates in China. Therefore, if we instead extrapolate other market trends and re-focus on this basic argument of what drives issuance: high coupons and constructive outlooks, then there is a strong case to argue that Crypto assets could become a meaningful percentage of underlying volumes.

Retail investors are only getting younger, especially in Asia, but even in North America, where the millennial generation is set to inherit some US\$70tn of wealth in the next 10-15 years by most estimates, and the younger generation, is undeniably extremely bullish Crypto assets. At this stage, we remain agnostic about the philosophical debate regarding the pros and cons of Crypto investing but are simply observing the trajectory of present trends and rationalizing the thought process and psyche of these increasingly financially empowered retail investors. We are not in the business of predicting the future with any certainty at Bach Option, but we are in the business of preparing ourselves for probabilistic outcomes, and this is one particular outcome that we are following closely. Logically in a world devoid of yield that is growing ever more comfortable with Crypto ownership, sizeable Crypto issuance in retail products should not be much of a stretch. It is public information that Goldman Sachs relaunched its Crypto derivatives trading desk earlier in the year and they also recently tokenized a bond deal on the Ethereum network. Just the other day Société Générale successfully tokenized the worlds' first structured product on the Tezos blockchain, and JP Morgan are involved in at least three projects including the launch of a dedicated Bitcoin fund specifically created for private wealth clients. Whether people like it or not, the proliferation of Crypto activity at investment banks is already happening before our very eyes. Ultimately Crypto adoption will be investor-led, and banks will follow, because their job is simply to serve their clients' entire financial needs and what better way to source natural (and discounted) long volatility exposure to this new asset class than through RSP.



BACH OPTION

One pushback we hear a lot is that Crypto assets trade every day of the week and are 24 hours markets so are difficult to hedge, but banks have traded Middle Eastern equity markets in Riyadh and Dubai at the weekend for years and structured products have been issued on currencies for decades, so we believe this argument is somewhat weak. Ultimately, we believe it is going to take extremely high coupons to capture the imaginations of that wall of Chinese retail money to exit domestic wealth management products or the bond market at large, and reallocate some portion to autocallables, but given the absolute levels of Crypto vol, which are multiples higher than every other asset class in the world, the coupons potentially on offer are extremely enticing. The challenge of course specifically in China will be convincing the authorities that this is a beneficial financial market development. At present it is not entirely clear what the primary objection to Crypto in China is. If it is the high levels of volatility, they will continue to fall over time, having already steadily dropped off over the past decade, with the annual average rolling 12m realized vol ratio between Bitcoin and the S&P500 falling from over 13x in 2015 to as low as 3x in recent history. If the issue is the size of the carbon footprint, then this too will take time to rebalance but is resolvable, as miners shift to cleaner energy sources. And also consider the fact that there is no reason why the products need to follow the traditional autocallable structures. The beauty of having such a high vol asset, is that it is not necessary to package a 5 year maturity note, nor expose retail investors to -50% drawdowns, it is perfectly feasible to shift both and still achieve exceptionally high coupons. The number of observation dates could be reduced or more monetization of upside vol captured too; but ultimately there are a multitude of redesigns that could be applied to get all stakeholders comfortable with the risks.

To this end, it is not infeasible that Crypto could eventually become the asset class that puts trillions of Renminbi-denominated private wealth to work in international markets. And unless banking regulations change, this activity will naturally require new ART partners, and likely mark the launch of a new era of opportunistic hedge fund entrants in the space. Also recall the fact that plenty of banks traded corridor variance on equity indices despite having no underlying retail business, so it would be naive to assume that this type of flow once it got going, would be limited exclusively to the 4 or 5 largest structured product issuing banks either. Ultimately, we believe that RSP will end up referencing Crypto assets, or more accurately Digital assets, the only real unknown is which countries and which investment banks are going to champion their initial adoption and growth.



Source: iStock

In summary, via this opaque channel of product issuance led out of Asia, retail investors could effectively force further institutional adoption of Crypto. The future of retail is definitely China, and it might just be Crypto too!

Appendix – Autocallable mini primer

Overview

- Autocallables, or autocalls are bond like instruments that offer a potential coupon, linked to the performance of an underlying or group of underlyings. They are issued in mono-form (referencing a single index or stock) or multi-form (referencing a basket of stocks or indices).
- The product is automatically called (effectively knocked out) and ceases to exist if the reference underlying (or worst performing underlying in a basket) is at or above a pre-determined level (typically 105% of the initial reference price), at a specific observation date in the future (quarterly or 6 monthly observations are standard).
- At maturity/expiry (which is ordinarily set at 5 years, with average durations nearer 24-30months), provided that the underlying(s) has/ve not reached the knock in barrier on the downside (aka the trigger level or protection barrier of the down and in put, usually set around 50% of spot), at a minimum the full capital will be returned. Only if the barrier is activated, will any level of capital loss transpire.



Figure A. Autocallables can essentially be decomposed into three components:



1. Capital Repayment

- Like most structured products, autocalls use a zero-coupon bond to provide the capital repayment portion at maturity, however since the product can be redeemed early there is no fixed investment term. As a consequence, the value of the zero coupon is therefore based on probabilistic outcomes, i.e. it is calculated based on the weighted values of the expectations of it being called in 1 yr, 2yr, 3yr and so on.

2. Market Risk

- Much of the value of an autocall is generated from the monetization of high skew, via the effective sale of a down and in put with strike at-the-money and knock-in barrier very far out of the money. The rationale for the retail investor being that this is a scenario very unlikely to happen. Above the knock in, the client will not suffer any capital loss, but will participate in 1:1 capital loss below the barrier.

3. Reward

- The premium from the down and in put combined with the value of the zero coupon bond discount determines the amount available to invest in the reward component. The reward is then delivered in the form of coupons, conditional on the performance of the underlying.

Additional notes

- In this mini primer we have described the traditional version of the autocall, however, it must be understood that in recent history there has been significant innovation. There is considerable breadth of underlying choice/asset class and the conditions placed upon the autocalls have changed a lot too, with the inclusion of features such as glider/lizard barriers etc. post 2017. In aggregate, the alterations have generally increased the probability of knock out, and thereby reduced the duration/vega risk of the position.

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