

Risk Management in Retrospect: The Collapse of Archegos Capital

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2021 has been a turbulent year for the markets. One of the many notable events was the collapse of Archegos Capital Management, a family office managing funds of \$10 billion. Its collapse has brought a collective loss of more than \$7 billion to three banks and prompted the public to reconsider the systemic risk of a single market participant has on the wider market. This paper focuses on analyzing the credit, market, and operational risks entailed in this event and how banks and us, risk management professionals, should reconsider our approach of managing risks.

1 Introduction

Archegos Capital Management was a family office that managed the personal assets of investor Bill Hwang. On March 26th, 2021 Archegos defaulted on its margin calls from several global investment banks. It is estimated that Archegos lost \$20 billion in 2 days resulting in Credit Suisse (CS) losing \$5.5 billion, Nomura (NMR) losing \$2.85 billion, and several other brokers. This paper outlines the events leading up to the default and critically analyzes the missteps in credit, market, and operational risk management from the perspective of the investment banks, with a strong emphasis on Credit Suisse. With each assessment, the paper will present a few risk management solutions that could help in the future.

Before its rebranding in 2013, Archegos was known as Tiger Asia Management. Tiger Asia had a series of

regulatory troubles. In 2012 in two separate incidents, Hwang and Tiger Asia were found guilty of insider trading leading to Hwang being fined for \$44 million and money being returned to investors. In February 2013, Tiger Asia Management rebranded to Archegos Capital Management. In October 2014, a Hong Kong tribunal banned Hwang and Archegos from trading securities in Hong Kong for 4 years [5], [3].

Archegos investing strategy consisted of fundamental research-driven long/short equity focused on long-term (18 months to 3 years) value investing. Its investments were concentrated in financial services, telecommunications, and internet/media companies. In addition, Archegos positions were mainly in total return swap (TRS), giving Archegos anonymity. A TRS work by the prime broker buying the shares and reporting itself as the beneficial owner, while in reality Archegos bears the economic risk. To execute the swap, Archegos would pay margin, and the rest of the trade is financed by the prime broker. These swaps are attractive to hedge funds and family offices as they allow them to build big positions through leverage and get higher returns while being anonymous [3], [9].

When the strategy worked, it paid off very well. From 2012 to 2016, Archegos's net asset value (NAV) grew: \$500 Million in 2012, \$955 million in 2013, \$1.905 billion in 2014, \$2.058 billion in 2015, \$3.865 billion in 2016. However, Archegos's NAV dropped in 2017 to \$1.818 billion (figure 1) [3]. This strategy and lack of risk management to address NAV fluctuations from Archegos led to Archegos defaulting.. Despite the regulatory problems and risky trading strategy, prime brokers were eager to work with

Archegos. CS, Morgan Stanley (MS), Deutsche Bank (DB) were some of the early banks to have Archegos as a client. Goldman Sachs (GS) wanted to work with Archegos at the time but its compliance department consistently said no until late 2020 [9].

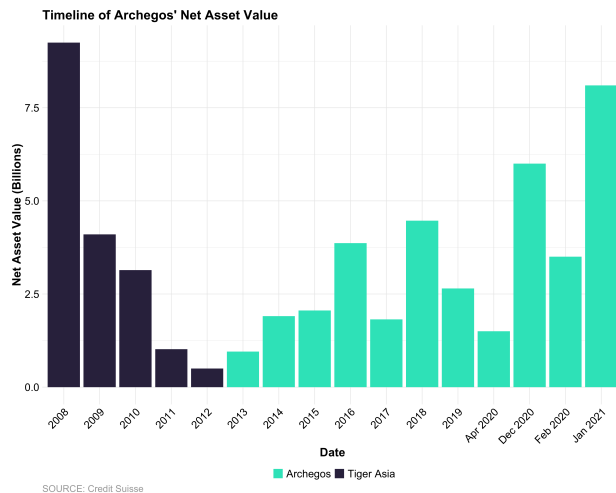


Figure 1

In *Credit Suisse Group Special Committee of the Board of Director's report on Archegos Capital Management* [3], it is reported several times that within CS's Prime Services, Archegos breached its potential exposure (PE) limit and stress scenario exposure (SE) limit many times. These exposure limits are used by CS's Prime Services Risk (PSR), the first line of defense within the prime business, and Credit Risk Management (CRM), the second line of defense within the risk management unit, to manage counterparty credit risk. Moreover, CS's CRM noted in its annual credit reviews, that Archegos did not have formalized risk management policies and procedures, its NAV kept fluctuating, continuously breach risk metrics, and many more. Despite these concerns, CS's Prime Services lowered its margin requirements for Archegos. Within CS's Prime Services, Archegos worked with Prime Financing which handled Archegos' synthetic trading, and with Prime Brokerage which handled all of Archegos' cash trading. Prime Financing's initial margin was 15%-25% for its swap positions and for Prime Brokerage's dynamic margin was 15%-18%. Archegos argued that other Prime Services were offering better rates and since Archegos had portfolios in both Prime Brokerage and Prime Financing, Archegos can cross-margin its swaps and cash equities positions so they can be covered by a single margin call. Prime Financing agreed and dropped their swap margin rate to 7.5%. The decrease by CS brought in more business from Archegos but greatly exacerbated the risk concerns.

Within Prime Services Risk (PSR) and CRM, multiple junior-level employees saw the problems and tried to raise concerns about them. A combination of understaffing, inexperienced risk employees, disorganiza-

tion, and lack of action from the senior level led to risk parameters continuing to be breached and Archegos facing no consequences. CRM noted in September 2020 that Archegos was a "significant relationship for Prime Services" and the business knew Archegos was doing business with other prime brokers. A sudden margin increase could result in "irreversible damage to the client relationship." [3].

After several failed attempts to get additional margin and things quickly getting out of control, in February 2021 Prime Financing tried to switch Archegos to dynamic margin and calculated with the switch, Archegos would have to post an additional \$3 billion of margin for a total margin of \$4 billion. A PSR analyst asked Archegos to discuss the switch and Archegos did not respond. CS kept following up with Archegos but was ignored. Eventually, Archegos responded saying they are considering the dynamic margin but in reality, didn't. Between March 11th to March 19th, Archegos began calling its excess variation margin it had historically maintained with CS. CS paid a total of \$2.4 billion to Archegos which was approved by PSR and CRM.

Between March 12th to March 26th, Prime Financing approved Archegos to execute \$1.48 billion of additional long net positions margined at 21.5%. Furthermore, on March 12th, CS renewed \$13 billion in net long positions for two more years mostly at the existing 7.5% margin. CS continued to approve new business and was giving Archegos money in variation margin despite Archegos ignoring their calls for switching to a dynamic margin system and posting additional margin.

In the months leading up to its default, Archegos had colossal positions across different dealers. For example, CS CRM's 2020 annual review showed that Archegos's long equity swap positions were \$1.7 billion, \$1.5 billion and \$1.2 billion for ViacomCBS, Baidu, and Tencent, respectively. Archegos massive position in ViacomCBS helped push the stock over \$100, for the first time ever. Over a year ago it was trading at around \$11. ViacomCBS executives were surprised at this and on March 22nd ViacomCBS announced a \$3 billion sale of stock and convertible debts [5]. On March 24th ViacomCBS stock plummeted by 30% and Tencent plummeted 20%, (figure 2), triggering margin calls across Archegos's brokers. CS determined it would need \$2.7 billion in margin for the next day. Due to the size of the call, the Co-Heads of Prime Services and Head of Equities called Archegos that evening to inform them. That same evening, CS's Investment Bank CEO and the Group's CRO were notified about the situation. This is the first time they are hearing about Archegos.

On March 25th, CS issued two margin calls - one for Prime Brokerage and the other for Prime Financing, totaling over \$2.8 billion. Archegos said that its cash reverse was exhausted from earlier margin calls in the week by other prime brokers and that Archegos was

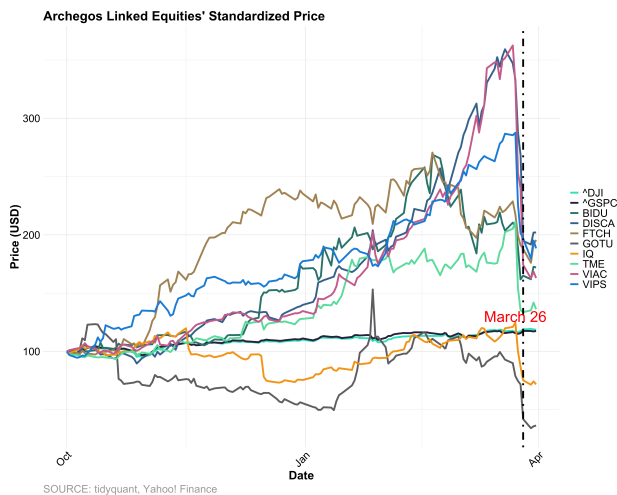


Figure 2

now slowly liquidating its positions to not disrupt the market.

That evening, Archegos held a meeting with its prime brokers including CS, NMR, MS, and GS. On the call, Archegos informed its prime brokers that it had \$120 billion in gross exposure and just \$9-\$10 billion in remaining equity. Archegos asked its brokers to enter into a standstill agreement, whereby the prime brokers would agree not to default Archegos while it liquidated its positions. CS and NMR were in agreement with that but MS and GS pushed back. The meeting concluded with them not working together [14], [3].

Before the markets open on March 26th, Archegos told CS that GS was organizing block sales of its positions and invited CS to participate. CS participated in three-led GS block trades, selling shares in Tencent, Baidu, and Vipshop. GS and CS sold \$3.3 billion and \$3 billion respectively in these blocks. MS and Wells Fargo & Co (WFC) soon followed [9].

On March 27th, Archegos approached its prime brokers again for a standstill agreement. The prime brokers discussed managed liquidation after Archegos dropped from the call. After discussing the process they would have to follow, DB, MS, and GS were not interested in participating in managed liquidation. However, CS, UBS, and NMR participated in such an agreement, and on March 28th, the three entered into a formal agreement. CS participated in block sales on April 5th and April 21st, liquidating \$3 billion and \$2.2 billion, respectively. By April 22nd, CS had liquidated 97% of its Archegos exposure. CS lost \$5.5 billion, NMR lost \$2.85 billion, MS lost \$911 million, UBS lost \$774 million. DB, WFC, and GS reported immaterial losses (figures 3, 9) [3]. Refer to the timeline for key events.

TIMELINE 1: Key Events

- 2012 • Tiger Asia pleads guilty to insider trading of Chinese bank stocks and pays \$44 million in fines
- February 2013 • Tiger Asia rebrands to Archegos
- October 2014 • Hwang and Archegos are banned from trading securities in Hong Kong for 4 years
- February 2021 • Prime Financing begins attempts to switch Archegos to dynamic margin
- March 11th – 19th • CS pays \$2.4 billion on excess variation margin to Archegos
- March 12th • CS renews \$13 billion in net long positions for two more years mostly at the 7.5% margin
- March 22nd • ViacomCBS announced a \$3 billion sale of stock and convertible debts
- March 24th • ViacomCBS and Tencent fall by 30% and 20% respectively
- March 24th • CS representatives inform Archegos of the \$2.8 billion margin call
- March 24th • CS's IB CEO and Group CRO are told the first time about Archegos
- March 25th • CS issues the margin call. Archegos is unable to post
- March 25th • Archegos fails to get a standstill agreement with its brokers
- March 26th • Archegos defaults
- March 26th • Block trading starts
- March 26th • DB sells \$4 billion in exposure to a direct buyer
- March 28th • CS, UBS and NMR agree to a managed liquidation plan
- April 5th • CS liquidates \$3 billion in exposure through block trades
- April 21st • CS liquidates \$2.2 billion in exposure through block trades
- April 22nd • CS has liquidated 97% of its exposure

2 Business Model Explained

Most large financial institutions have Prime Services which are offered to hedge funds and other large investment clients. The services they provide are securities lending, leveraged trade execution, and cash management for a fee. Within Prime Services there are subunits that offer specific services. In the case of CS, there is Prime Brokerage which handles clients' cash trading, and Prime Financing which handled clients' synthetic trading with derivatives such

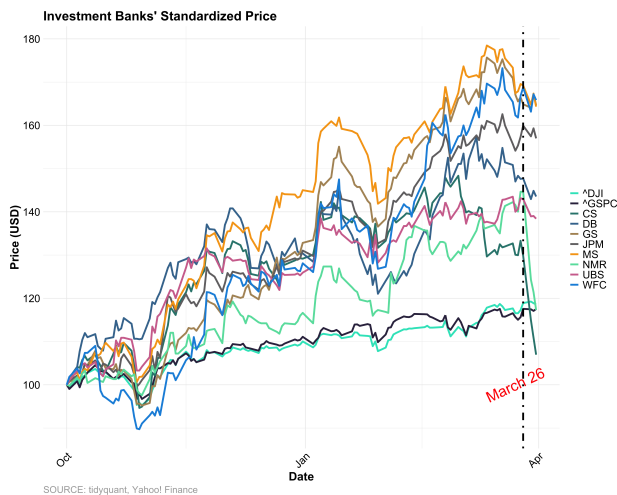


Figure 3

as TRS. With a TRS, clients make payments to the prime broker based on the fee and an interest rate such as LIBOR. The prime broker buys the securities and makes payments to the client on the total return on the securities. If the underlying securities fall, the client must pay the prime broker margin and the regular fees it has agreed to [12]. These large investment clients generate a significant amount of revenue for the banks. For instance, Archegos's revenue for CS was \$8.5 million in 2019, \$17.4 million in 2020, and \$6.4 million YTD as of February 2021 (more than \$40 million annualized) [3].

Prime Brokerage and Prime Financing are intended to be low-risk businesses. Both units rely on an initial margin, if a client defaults, the initial margin is supposed to cover potential adverse market movements from the point of default until Prime Brokerage and Prime Financing are able to sell the underlying securities or until Prime Financing is able to re-hedge. Both units calculate initial margin differently; Prime Brokerage uses dynamic margin to factor in changes to portfolio characteristics (e.g. volatility, concentration, bias, etc.). Prime Financing uses static margin that is calculated on the notional value of the TRS at inception and remains static in dollar terms over the life of the swap. Consequently, if the client's positions increased, the initial margin as a percentage of the position being financed erodes and the client's leverage with the bank would increase. This is what happened with CS and Archegos, and the problem was exacerbated by the use of bullet swaps that Archegos favoured. Bullet swaps do not periodically reset to the current market value and have an average tenor of 24 months. If the bullet swap did reset to the current market value, there would have been an increase in margin.

Prime Financing also required variation margin which is the collateral posted to cover a party's exposure to its counterparty based on movements in the value of the parties' positions during the life of

the trade. This is calculated by using the market-to-market movements in the parties' trading positions on a daily basis to determine the level of exposure, which then determines whether variation margin must be transferred between the parties to cover the exposure.

For CS the first line of defense is the Prime Services business is itself. Each employee is responsible for safeguarding CS from losses. Moreover, Prime Services had its own risk team, Prime Services Risk (PSR) which was responsible for setting margin rates and for communicating any necessary margin increases to the client. Moreover, PSR ran and reviewed portfolio-level stress loss scenarios and other analytics designed to flag concerning client exposures, and monitor the client's portfolio to ensure that it does not exceed the risk limits prescribed by the second line of defense, the Risk Management function. The Risk Management function contains Credit Risk Management (CRM), Global Market Risk Management (GMRM), and other risk units. The Risk businesses ran across all of CS's businesses including Prime Services [3]. The different risk units worked mostly independently and barely communicated with each other. In particular, for Prime Services the main risk concern was credit risk, and worked closely with CRM. The following sections present how missteps in credit risk caused a domino effect for missteps in other risk units.

For CS the first line of defense is the Prime Services business is itself. Each employee is responsible for safeguarding CS from losses. Moreover, Prime Services had its own risk team, Prime Services Risk (PSR) which was responsible for setting margin rates and for communicating any necessary margin increases to the client. Moreover, PSR ran and reviewed portfolio-level stress loss scenarios and other analytics designed to flag concerning client exposures. The team also monitors the client's portfolio to ensure that it does not exceed the risk limits prescribed by the second line of defense, the Risk Management function. The Risk Management function contains Credit Risk Management (CRM), Global Market Risk Management (GMRM), and other risk units. The Risk businesses ran across all of CS's businesses including Prime Services [3]. Unfortunately, the different risk units worked mostly independently and barely communicated with each other. In particular, for Prime Services the main risk concern was credit risk. PSR and CRM did work together but both units did not express their concerns to GMRM. The following sections present how missteps in credit risk caused a domino effect for missteps in other risk units.

3 Missteps in Risk Management

3.1 Credit Risk

It is apparent that the central theme of the Archegos debacle was missteps in credit risk. While a lot of scrutinies were around how CS mismanaged credit risk, we see the problem stemming further back from when they assessed the credit profile of Archegos. CS did not take into consideration Hwang's dubious track record when conducting the qualitative credit review of Archegos. In 2012, Tiger Asia and Hwang entered into a settlement with the SEC regarding allegations of insider trading. In 2013, Hwang was ordered to pay a fine of \$5.8 million to compensate investors affected by the insider trades and was banned from trading securities in Hong Kong for 4 years. The series of historical frauds and regulatory scrutiny, in theory, should be flagged by CS in the KYC review. However, not only did Tiger Asia/Archegos not receive tighter scrutiny over its suspicious track record, but CS also did not take additional steps to investigate the potential additional credit risk that arose from its past fraudulent activities. CS's CRM, in fact, recommended an upgrade of Archegos's internal credit rating from B to B+ in 2014 (figure 4) despite acknowledging weakness in Archegos's "mediocre operational management practices/fraud risk".

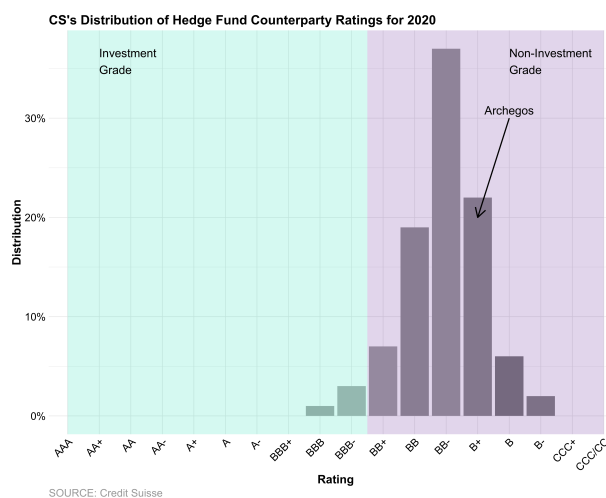


Figure 4

Risks related to Archegos's character extend beyond its problematic track record as Archegos also demonstrated poor risk management strategy. CS also acknowledged in its annual credit reviews that Archegos had "poor risk management practices and procedures" as they "operate off informal concentration guidelines", do not "operate with a formalized set of risk management policies and procedures" and fail to "use stop-loss limits". Even though CS was able to identify key character risks regarding to Archegos's strategy and execution, CS did not see any material impact of these qualitative elements on its overall

credit profile.

CS relied on 2 metrics for quantitative assessment of credit risk: potential exposure (PE) and scenario exposure (SE). PE is similar to the *Value at Risk* metric in market risk. It is a calculation to assess the maximum potential exposure of the bank at the 95% confidence level in the event of counterparty default, which also considers the level of margins posted by a counterparty. Scenario exposure is similar to stress testing, which looks at different scenarios of large instantaneous market moves and compares banks' maximum exposures across different scenarios. Some examples of the scenarios are like Severe Equity Crash, which simulates a 30% decrease in equity prices in developed markets and 45% drop in emerging markets & Japan; or the less punitive Bad Week Equity Crash, which simulates a 20% decrease in equity prices in developed markets and a 30% drop in emerging markets and Japan. CRM CS then based their limits on PE & Scenario exposure and monitored for any breach.

From 2020 to 2021, Archegos had multiple persistent breaches of its PE limits and SE limits. Consider the illustration in figure 5, Archegos's PE rose to \$528 million, more than 20 times its \$20 million PE limit.

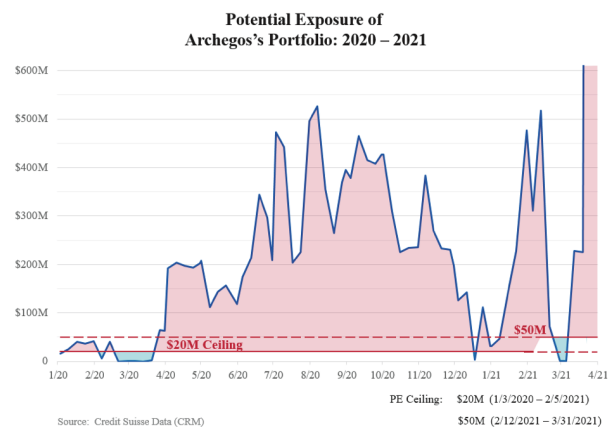


Figure 5

When we look at the net scenario exposure of Archegos's portfolio shown in figure 6, we can see that Archegos breached its limit 90% of the time, which prompted CS to utilize a more forgiving Bad Week scenario to calculate Archegos's exposure limit. Putting aside the legitimacy of adopting a laxer limit specifically for the Archegos's account, they still breached the limit by almost \$400 million at peak.

In January 2020, CS retired the historical-simulation model of calculating PE and changed the calculation methodology to a more sophisticated Strategic Enhanced Potential Exposure model (S-EPE) based on Monte Carlo simulation for higher reliability and accuracy. Since S-EPE was not available for equity swaps at that time, CS adopted the simpler Strategic Enhanced Factor model (S-EF), which is based on historical simulation, to calculate PE for equity swaps

instead. The major difference between S-EPE and S-EF is how they derive the range of potential exposure. S-EPE model is a granular and time-intensive estimation from Monte Carlo simulation of netted underlying positions while S-EF is a simplified and fallback model that simulates exposure of the real portfolio over time. Internal teams expected that S-EF tends to generate more conservative results than S-EPE. With the quantitative assessment metrics at hand, CS CRM teams further acknowledged the challenges of PE measure. Data quality and calculation issues skewed the results generated from S-EF. Many large adjustments had to be made. It undermined teams' confidence in the PE measure, resulting in a typical blasé response to large PE numbers despite it being officially risk measure. CRM and PSR downplayed the red flags shown in PE utilizations and brushed off any need for immediate remediation towards PE limit breaches even though, as shown in Figure 5, these breaches were too frequent and preposterous. It is important to have appropriate risk management metrics as well as accurate measurements. The impact of inaccurate risk measurement can cascade into the operational risk that induces a lackadaisical culture towards risk management and governance, which will be discussed later in the operational risk section.

Margining is critical for credit risk mitigation. Archegos's portfolio in CS was constantly under-margined, partially due to inadequate execution of margin calculation within CS, and partially due to poor enforcement of margin methodology. As a result, CS ended up with significant losses. Throughout the banking relationship, CS reduced the margin requirements several times: CS dropped the bias add-ons on Archegos's Prime Brokerage portfolio in 2017, reduced the standard initial margin charged on Prime Financing swaps from 20% to 7.5% in 2019, was slow to increase swap margins after Archegos's portfolio turned significant long-biased thus margin offsetting through short swaps was no longer applied. The

persistent under-margined portfolio exposed CS to significant credit risks as margin collected by CS was insufficient to protect it from Archegos's default.

As explained in Business Model Explained, there are two types of initial margin methodologies: dynamic margin and static margin. One key reason for CS being significantly under-margined was the use of static margining. Firstly, the margin percentage under static margining tends to stay the same regardless of changes in position's market value or market situations. It means the initial margin rate would not be adjusted to reflect market conditions accordingly to provide banks with extra buffer needed during extreme conditions. As Archegos's portfolio grew more concentrated and long-biased, the initial margin percentage failed to update to reflect the increase in risk exposure, and thus, CS's positions were under-margined relative to the risks Archegos's portfolio was exposed to. Secondly, the overall portfolio suffers from margin erosion due to the use of bullet swaps. Archegos was required to post a fixed amount of initial margin set against the initial gross market value (GMV) of the swap. If market value appreciates, Archegos would have been required to post more or less initial margin depending on the gross market value at that time. However, bullet swaps are swaps with a life of more than a year that do not reset periodically based on current market values. Even if the swap increases in value, the amount of initial margin would stay the same as the value of bullet swaps does not reset and therefore, the relative percentage of margin that CS holds would be lower. CS ended up with substantial margin erosion due to a lengthy holding period without any contractual mechanism to reset the dollar value of initial margin posted. With CS charging usually low margin rates compared to other prime brokers for Archegos already, being the only broker using static margining results in CS's outsized counterparty credit risk not being properly mitigated.

Dynamic margining, where add-ons based on market or portfolio characteristics will be adopted with a base initial margin rate, seems an optimal solution. Even the simplest form of dynamic margining is capable of shielding primer brokers from initial margin erosion, which in theory is better than static margining in protecting banks from credit risk exposure. Consider a single stock position of \$25,000 in value with 20% initial margin required. If static margining was adopted, the client would be required to post \$5,000 cash as initial margin. Even if the stock drops in value to \$22,000, there would be no change in the initial margin required. However, the \$3,000 decrease in the market value of the stock would result in a corresponding \$3,000 decrease in the client's equity. Now that client's equity is worth \$2,000, which implies that the initial margin rate would erode to 9% instead of 20%, heightening the bank's credit risk exposure. Figure 7 visualizes the margin component of a client's portfolio. Under dynamic margining, 20% initial mar-

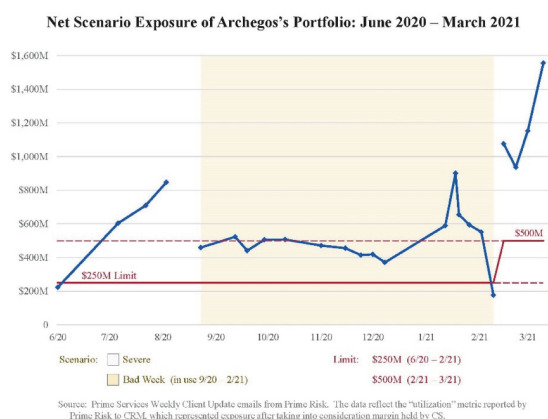


Figure 6

gin is observed throughout the life of the portfolio. A \$3,000 drop-in value would require the client to post another \$2,400 ($\$22,000 \times 20\% - \$2,000$) as initial margin to bring the margin level back to 20% of portfolio's market value.

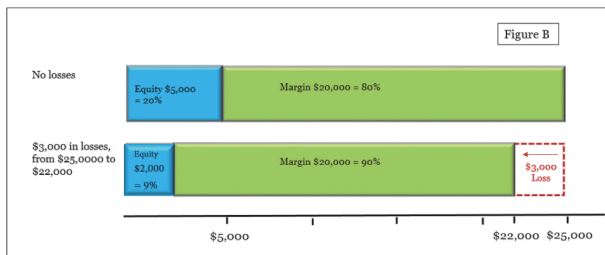


Figure 7

In fact, dynamic margining is more complicated than simply observing a static percentage of a portfolio's market value. Dynamic margining considers a wider set of factors than static margining, factors like country of origin of the asset, client's credit profile, client's portfolio, market's liquidity, volatility, and so on. The initial margin rate calculated under dynamic margining varies over time as market conditions vary, so clients might be required to post more (less) margin throughout the life of securities. For instance, if trades or security price movements result in a client's portfolio becoming more directionally biased, a bias add-on might be triggered and the initial margin rate will increase. Or as the client purchases more of the same security, a concentration threshold might be surpassed, triggering a concentration add-on to the margin rate. We can see that not only is dynamic margining more effective in eliminating the effect of margin erosion, the adaptability of dynamic margining also reduces banks' credit risk as the market situation evolves.

Even though CS had already built out the capabilities for dynamic margining, it failed to onboard Archegos in time for that. By September 2020, CS was able to deliver 'cross margining', where a client's Primer Brokerage and Prime Financing positions would be aggregated and netted to one single portfolio, and dynamic margining would be applied to the combined portfolio. By onboarding to dynamic margining, clients with both Prime Brokerage and Prime Financing accounts, like Archegos, could potentially benefit from 'Margin Relief', as both accounts could potentially offset each other through and the margin requirements would be lowered as a result. While CS seems to have the infrastructure in place to manage Archegos's credit risk and the CRM team agreed that onboarding Archegos to the 'Margin Relief' platform would work the best for both CS and Archegos, it took CS five months to proceed with a proposal on the transition of Archegos to dynamic margining. In contrast, 195 Prime Services clients were transitioned to dynamic margining over 90 days after Archegos's default. The dynamic

margin proposal was also insufficient to protect CS from counterparty risk because of favorable bias towards the business side over the risk management side. CS's more accommodative proposal allowed Archegos to only post a \$1.3 to \$1.5 billion day-one step-up margin instead of \$3 billion under standard dynamic margining terms. It seems that from here, the mismanagement of credit risk stemmed from a more deeply rooted problem of inadequate operational risk control. The untimely rollout of the transition and the prioritization of business over risks were a form of operational risks. Yet, these operational risks, in the end, exposed CS to higher levels of counterparty credit risk. Again, this shows how different types of risks are intertwined with each other and can even amplify each other at times.

3.2 Market Risk

The previous section presented the importance of accurate counterparty credit risk measurement and governance, as well as the importance of adequate methodology for margin and actively collecting the right amount of it. Furthermore, in the introduction we saw that market risk arises in CS since it took on large, concentrated, illiquid exposure to Archegos. CS then became exposed entirely to the market risk of the Archegos's positions booked with them when it defaulted on its margin calls. The missteps in credit risk and the defaulting slip into a market risk problem. This section goes into more detail about Archegos's highly leveraged and concentrated positions, the prime brokers' struggle to relieve its exposure, and potential solutions.

Both CS's Prime Brokerage and Prime Financing are intended to be low-risk businesses. Their market risk is evaluated and offset through hedging or selling the underlying securities. Specifically, in Prime Financing, traders on the Delta One Desk want to be market-risk neutral. They would enter into a TRS and immediately hedge CS market exposure in the transaction by purchasing the underlying stock. The trader can also enter into a TRS in the opposite direction. This offsetting would hedge Prime Financing's market risk in the initial transaction, leaving it market-risk neutral, and allows Prime Financing to sell the stock hedge. Using an offsetting TRS would mean that the synthetic client's position would now be offset with a synthetic hedge position, which is more efficient from a balance sheet and/or funding perspective [3]. In theory, this process works well but the missteps in credit risk left Prime Financing to no longer be market-risk neutral. The objective now was for CS to quickly get rid of its exposure.

Archegos's prime brokers knew that Archegos was doing business with competing prime brokers. Some analysts in these prime brokers had an idea and were concerned that Archegos was also building highly

leveraged and concentrated positions with their competitors. For instance, in February 2021, a PSR analyst told the Head of PSR that if there was an issue with one of Archegos large, long positions "all [prime] brokers would be looking to exit simultaneously". None of the prime brokers had lock-up agreements with Archegos. Meaning, if the prime brokers all perceived the risk and increased their margins simultaneously, this could in theory force a liquidation [3]. During the week of March 25th this is what happened and after a failed standstill agreement the prime brokers started selling their positions in massive blocks spanning days. GS, MS, and WFC started the sell-off, followed by CS and NMR. DB was able to avoid a \$4 billion loss by making a private direct deal with Marshall Wace, one of Europe's largest hedge fund managers [1]. With the huge sell-off of Archegos linked securities, the price of the securities fell significantly, meaning that any exposure remaining had worsening losses (figure 8).

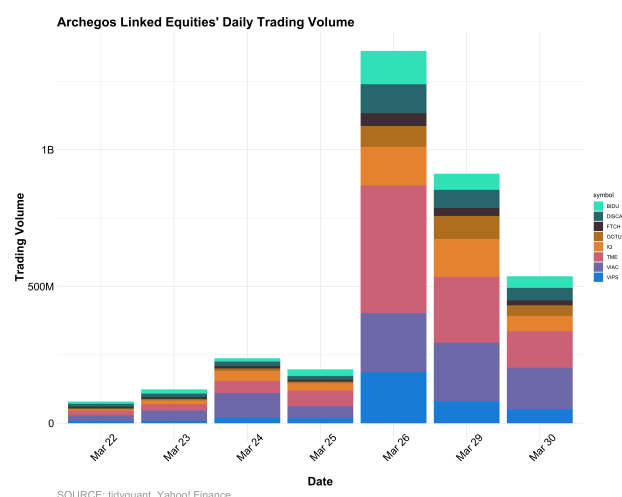


Figure 8

Family businesses like Archegos do not have to publicly disclose their positions and are not obligated to tell their prime brokers. If the prime brokers all knew Archegos's positions and with whom, it could have helped them be more risk-averse. Throughout our research, it was hard to determine what the banks' formal resolution plan was to remove this type of exposure. We did see the prime brokers entertain the idea of a standstill agreement which would have spread the loss more evenly across the prime brokers. Thinking in terms of game theory, we can model this problem as a Prisoners' Dilemma where the dominant strategy for each prime broker is to sell the securities as fast as possible. In practice, the cooperative strategy is the standstill agreement since it would spread the loss more evenly, Archegos would be less likely to default, and the market overall would be less volatile. In reality, a cooperative strategy where all the prime brokers working independently would be difficult to reach. However, it can be helpful to add a general framework

to a bank's corporate resolutions plan that could help mitigate the losses. The characteristics in the framework are as follows; (1) calculate the bank's market exposure to the securities, (2) continue to hedge the bank's exposure, (3) attempt to find a direct buyer of the securities, (4) facilitate block trades.

Observe, this framework uses multiple strategies that vary in difficulty to implement. For instance, (2) would reduce the losses but not get rid of the exposure entirely. Also, hedging is fairly straightforward for a bank to do. (3) would quickly get rid of the exposure but can be difficult and slow to find a buyer. Lastly, (4) block trading also quickly gets rid of the exposure however block trading usually needs to be set up outside market hours and needs a block trading facility. (1) is clearly needed and the calculations are relatively simple for a bank. However, a bank could overlook certain components in its calculation.

There is an interconnection between counterparty credit risk and market risk. A robust hedging framework would address the market value fluctuation to account for counterparty credit risk, by creating a form of insurance against the loss from counterparty default. Recall, in the business model explained section, the use of bullet swaps increases the holding period significantly because of no resets. The exposure extends due to the lengthy holding period, as bullet swaps on average have a tenor length of 24 months. The traditional back-to-back hedging is market-risk neutral, but this setup can not guarantee Prime Financing to stay truly fair market value risk-neutral. Thankfully, CS's X-Valuation Adjustment (XVA) group could have helped. XVA is a group of valuation adjustments to assess the fair value of derivative contracts by considering future exposure throughout the life of the derivatives. For example, Credit Valuation Adjustment (CVA) considers the possible losses due to derivative counterparty defaults [11]. The utilization and integration of XVA desk could provide insurance to the business for derivative contracts against defaults and the additional hedging would help to achieve fair market value-neutral to an extension to avoid counterparty credit risk cascading to several market risks.

3.3 Operational Risk

While Archegos' default brought the industry's credit and market risk management practices into the limelight, it also unsurfaced an underlying problem that had made CS suffer a much larger loss than other banks from the default as seen in figure 9.

As identified in *Credit Suisse Group Special Committee of the Board of Director's report on Archegos Capital Management* [3], The Archegos default “exposed several significant deficiencies in CS’s risk culture”. What is seen here is the persistent lackadaisical attitude towards risk discipline and reckless culture that aggravated CS’s loss, if not led to it. As men-

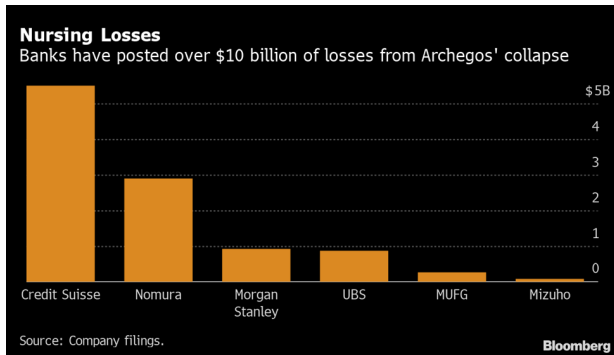


Figure 9

tioned previously, CS in fact had the systems in place, albeit imperfect, to identify acute flags which were in the end ignored by risk management personnel. We see the more prominent problem here being CS acting on the red flags in a timely manner than accurately identifying the risks.

The reckless culture within the organization was best demonstrated by business being prioritized to risk management. Under multiple situations, the risk function did not push back on the business' decisions on eliminating limit breaches, it instead enabled the business' prioritization of Archegos's business by constantly making margin accommodations. For example, CRM advocated an exception to the scenario appetite by arguing that a precipitous increase in margins to remediate the breach in limit would mean CS losing the business of Archegos to other prime brokers. However, one might question the objectiveness of CRM, as the second line of defense, here. Moreover, it was discovered that within CRM, senior risk employees did not support more junior colleagues' efforts in urgent remediation of Archegos's red flags. Even though junior staff uncovered that CS was the prime broker with disproportionate exposure to Archegos out of all prime brokers on the street and that IB CRO was well aware of Archegos's persistent exposure limit breaches and under-margined accounts, they did not impose deadlines for remediation or escalate to more senior executives.

The indifference towards risk control was aggravated by the lack of experienced risk management personnel within the organization. Throughout Prime Services Risk and Credit Risk Management, there was inadequate staffing. Senior employees reported an overwhelming number of reports and data that made it difficult for them to comprehend and act on the information received daily. As they felt burnt out and left the company, these more experienced individuals were instead replaced with less experienced ones. The 'juniorization' of PSR led to hollowing out of the PSR which simply had immobilized the first line of defense in the risk management of prime brokerage business. The situation only exasperated when the Head of PSR was replaced with a long-time Prime Ser-

vices marketing executive with extensive experience in client services but no training in risk management.

While management was responsible for the injudicious cost-cutting that led to insufficient investment in risk personnel and technology, the silo-ed organizational structure also impeded the swift escalation and action on risks. It was clear that even though both PSR and CRM are important lines of defense within the organization, the blurred responsibilities between the two functions led to blame imputation on each other. Even though clearly defined roles and responsibilities and reporting structure would strengthen the risk management process, in the end, it was up to every individual within the organization to be proactive to act on the signals they have identified. From traders who did not perform credit checks before trade execution to senior managers within PSR or CRM who failed to escalate the troubling signs of Archegos despite the bank's increasing exposure, all of them shared the same responsibility of questioning each business decision with a risk management mindset.

4 Conclusion

The paper presents a detailed analysis of the missteps of credit, market, and operational risk management from the perspective of a Credit Suisse over its Archegos account. We have explored the events leading up to Archegos's default and the multitude of red flags that were ignored. Significant challenges include insufficient margining, difficulty in hedging and unwinding underlying securities, and the lack of disciplined risk management culture. Despite that, there is a comfort to be found. Banks did have systems and processes in place to identify these red flags. Yet, it was up to risk management professionals to act on these red flags, which requires a change in risk management attitude, an attitude where risk management is treated as a way of facilitating profit-making in business instead of simply a cost-bearing unit.

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