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The pandemic risk for financial services companies: A case study of Covid-19

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ABSTRACT: *A global pandemic is an infectious disease affecting many countries globally. While posting a serious health threat to all individuals, it also strikes the financial markets swiftly and broadly. This paper explores how a pandemic impacts banks' risk profile. A pandemic and its aftermath often claim hundreds of thousands of lives and cause unprecedented market movements. The paper illustrates the impact of a pandemic through a case study of Covid-19 by assessing the public information available of bulge bracket banks. The total risk exposures for the major bulge bracket banks have increased dramatically during the first quarter of 2020, and the increase is clearly linked to the pandemic outbreak. Banks have responded to the risk increase by transferring their risks, using hedging strategies, and asking for more collaterals. These insights can help risk professionals manage risks and better prepare for similar situations in the future.*

KEYWORDS: *Motivation, Research Approach , Risk, Financial, Global Corporate.*

1. Introduction

This paper explores how global pandemic posts impacts on financial services companies' risk profile. Covid-19 is the model case.

1.1 Motivation

Covid-19 was first discovered in Wuhan, China, in December 2019 and is now a pandemic affecting every country around the globe. Causing 16,495,309 confirmed cases and 654,327 deaths (John Hopkins, 31st July 2020), it spreads quickly from person to person. In the meantime, it also hit the financial markets in unprecedented ways. While the exact pandemic risk on economies is not yet clear, financial markets have already experienced unprecedented movements. During March 2020, global stocks saw a decrease of at least 25%, and 30% in most G20 nations. Especially on 9

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

March, most global stock markets reported severe contradictions, caused by the Russia-Saudi Arabia oil price war amid Covid-19.

Financial services companies have seen volatilities in their share prices and experienced vast increases in several types of risk exposures. Impacts on financial services companies on this scale have never been seen in the past. Therefore, while coping actively with the current risks, it is also important for risk managers to thoroughly reflect on the experience and better prepare for similar circumstances in the future.

1.2 Research Approach

This paper performs a quantitative analysis of public information available for bulge bracket banks in the world. The analysis runs from October 2018 to March 2020, which is an appropriate time scale focusing on the March 2020 market volatility and its aftermath. The relevant underlying data is from regular disclosures required by supervisors on the banks' investor relations webpages. Disclosures include SEC filings such as Form 6-K, Form 10-K and Form 10-Q, annual reports and Pillar 3 disclosures. The following three sections assemble the analysis and present results through risk weighted asset, country risk, credit risk and market risk profiles.

2. Country Risk

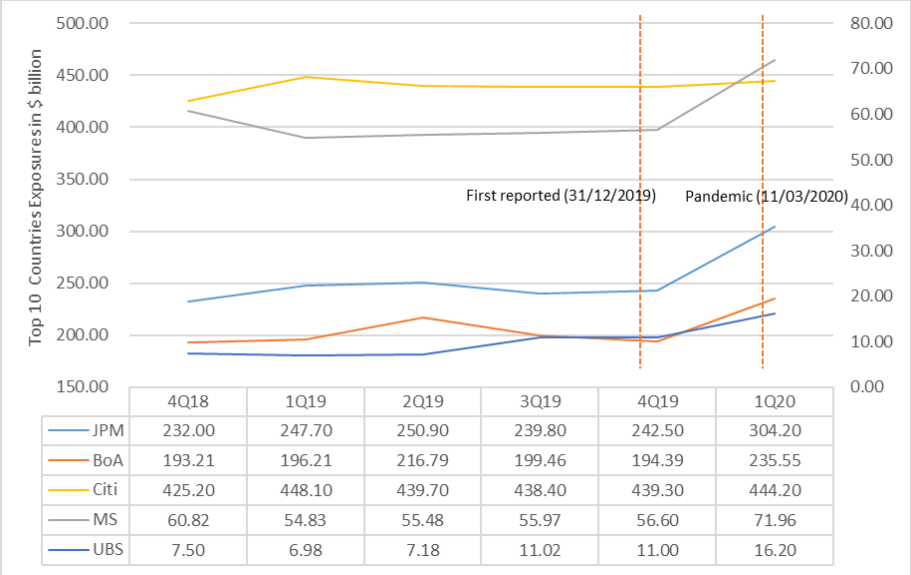
Country risk is a primary risk including all country-specific events that occur within a jurisdiction and may lead to an impairment of banks' exposures. Country risk can result from two types of events, namely, transfer risk events, i.e. the country's authorities cannot or will not allow the foreign currency to be obtained or paid by the counterparty, and systemic country risk events, i.e. country-specific political or macroeconomic developments.

The Covid-19 pandemic, and its impact on growth, employment, and debt dynamics, more specifically, currency value, interest rate level and country-specific credit spreads, as well as the debt and equity markets, has become the primary driver of country risk and would remain so in the near future.

In several countries, large movements in market risk factors continue to rise, and there are concerns about the potential for further impacts of the virus. For instance, in May 2020, Argentina agreed to continue talks with debtholders to restructure around $65 billion of its foreign debt, since the country's economy has been stroked hard by the Covid-19 pandemic. This is an example of a systemic country risk event that may pose risks to the country's debtholders and institutions having trade relations with the country or companies within the country. A number of emerging markets are also facing economic, political, and market pressures.

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

For financial services companies, the risks of a country crisis, whether caused by a transfer or systemic risk event, are the risk of losses resulting from severe movements in market risk factors and the risk of losses resulting from the default of entities. Using the data from the country risk section on the banks' investor relations webpages, the top 10 countries exposures are plotted over time for the five majorly affected banks (see Fig. 1). Whilst the exposure numbers from Q4 2018 to Q4 2019 are relatively stable with small fluctuations, almost all institutions experienced a sharp increase in country risk exposure during Q1 2020. The largest increase was seen on Morgan Stanley, whose exposure increased by 27.13% from $56.60 billion to $71.96 billion. Meanwhile, Citigroup experienced the smallest increase from $439.30 billion to $444.20 billion.



	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20
JPM	232.00	247.70	250.90	239.80	242.50	304.20
BoA	193.21	196.21	216.79	199.46	194.39	235.55
Citi	425.20	448.10	439.70	438.40	439.30	444.20
MS	60.82	54.83	55.48	55.97	56.60	71.96
UBS	7.50	6.98	7.18	11.02	11.00	16.20

Fig. 1. Top 10 Countries Exposures for major financial services companies.

Note: 1. Goldman Sachs is not included here since it does not have country risk measurement; 2. For illustration purpose, data for JP Morgan Chase & Co., Bank of America Corporation, and Citigroup Inc. is illustrated on the primary vertical axis, whilst data for UBS Group AG and Morgan Stanley is illustrated on the Secondary vertical axis; 3. The exposures for UBS Group AG are particularly low since the data used is the exposures to eurozone countries rated lower than AAA, whilst the data for other banks is the top 10 countries exposures.

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

Banks	Exposures in 4Q18	Exposures in 1Q19	Difference1	Percentage Difference1	Exposures in 4Q19	Exposures in 1Q20	Difference2	Percentage Difference2	Difference-in-Difference
JPM	232.00	247.70	15.70	6.77%	242.50	304.20	61.70	25.44%	46.00
BoA	193.21	196.21	3.00	1.55%	194.39	235.55	41.16	21.17%	38.16
MS	60.82	54.83	-5.99	-9.85%	56.60	71.96	15.36	27.13%	21.35
Citi	425.20	448.10	22.90	5.39%	439.30	444.20	4.90	1.12%	-18.00
UBS	7.50	6.98	-0.52	-6.92%	11.00	16.20	5.20	47.24%	5.72

Table 1. Difference-in-Difference analysis of top 10 countries exposures

Note: 1. Difference1 and Difference 2 in the table calculate the difference in exposures between Q4 2018 and Q1 2019, and Q4 2019 and Q4 2020, respectively; 2. The Difference-in-Difference number calculated the difference between Difference1 and Difference2.

There was an increase in exposures during Q1 2019 for most of the banks except for MS and UBS which experienced a slight decrease (see Table 1), demonstrating the possibility of the large increase during Q1 2020 to be caused by seasonal factors. To exclude the effect of cyclical movements in exposures, difference-in-difference technology is used.

Whilst the difference in exposures between Q4 2019 and Q1 2020 for Citigroup Inc. is less than the one between Q4 2018 and Q1 2019, the difference-in-differences for all the other banks are positive. Taking JP Morgan Chase & Co. as an example, the difference between exposures of Q4 2018 and Q1 2019 is $15.70 billion, and the difference between exposures of Q4 2019 and Q1 2020 is $61.70 billion, resulting in a difference-in-difference of $46.00 billion. The difference-in-difference numbers exclude the effect of cyclical movements in the exposures, so the sharp increase in exposures during Q1 2020 was clearly a result of the Covid-19 pandemic.

Financial services companies must continue to monitor potential moves in market risk factors. For countries that have already occurred severe movements, banks should actively manage the excess risk exposures by adjusting the country's risk limit or reducing exposure. Banks must have a comprehensive country risk management framework combined with credit and market risk fundamentals to ensure that their portfolios are well diversified and prevented from excessive risk concentrations.

3. Credit Risk

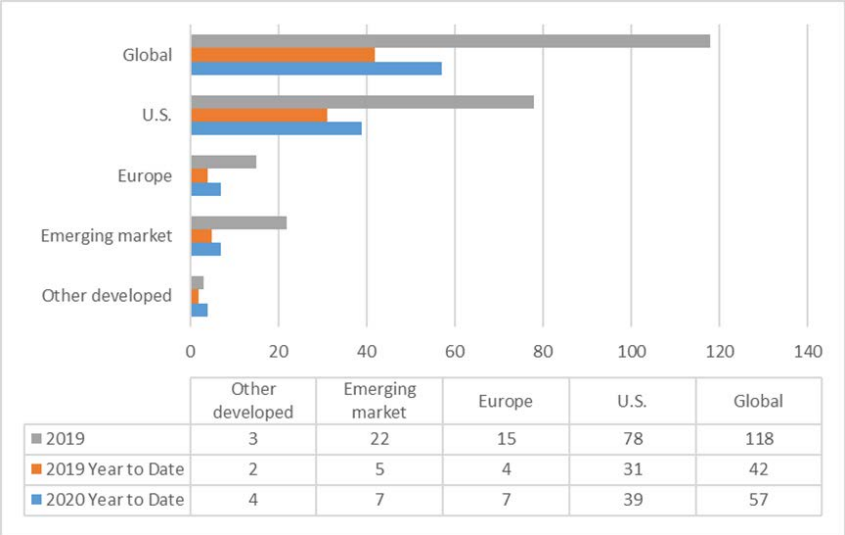
Credit risk is the risk of loss resulting from the failure of a counterparty to meet its contractual obligations to the banks. Credit risk is an integral part of the banks' activities, including lending, underwriting, and derivatives. Adverse economic or market movements may lead to impairments and defaults on banks' credit exposures since counterparties are likely to default in adverse economic or market conditions. Poor economic or market conditions may also lead to declines in the value of the

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

collateral.

The Covid-19 pandemic has led to serious disruptions to corporations' production activities and has decreased their amount of supply. While companies' fixed costs remained stable, a decrease in revenues seriously weakened firms' cash generating abilities, and eventually led to a dramatic increase in global corporate defaults. In the first five months of 2020, 28 non-financial corporate defaults were recorded, compared to 25 in the full year of 2019 (Fitch Ratings, 2020). The Covid-19 related lockdown regulations are another reason for the increase in numbers. Under the broader market circumstance, there are several specific reasons for defaults so far in 2020. Missed debt payment and default on financial obligations accounted for around 50% of the default cases, whilst the remaining half of the defaults were caused evenly by bankruptcy and distressed exchanges.

Using the data from S&P Global, global corporate defaults are plotted by region (see Fig. 2). For the same period from 1st January to 31st March, the number of corporate defaults increased by 15 from 42 in 2019 to 57 in 2020. The 12-month-trailing speculative-grade default rate for the global consumer services sector increased to 4.6% in March 2020, its highest point since May 2018 (S&P Global, 2020).



	Other developed	Emerging market	Europe	U.S.	Global
2019	3	22	15	78	118
2019 Year to Date	2	5	4	31	42
2020 Year to Date	4	7	7	39	57

Fig. 2. Global Corporate Defaults by Region

Note: 1. Year-to-date data as of April 22, 2020; 2. Other developed region includes Australia, Canada, Japan, and New Zealand.

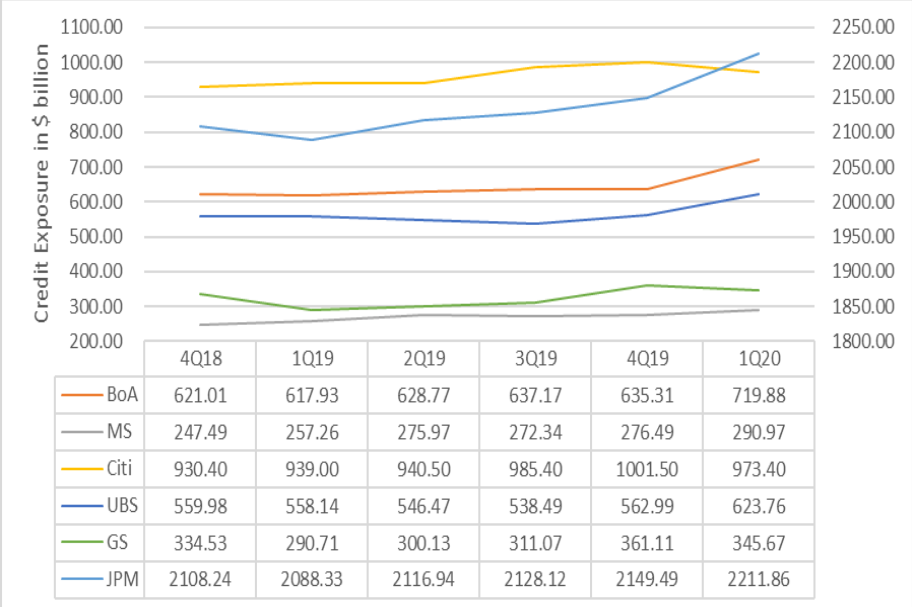
Banks often report their credit risk exposures by two different asset classes, which are banking products and traded products. Some examples of banking products are loans, commitments, and letters of credits, including any facilities

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

related to cash management, whilst trading products are traded with counterparties. Traded products include over the counter derivatives, exchange-traded derivatives, and securities-based lending.

Using the data from the credit risk section on the banks' investor relations webpages, the total credit exposures are plotted over time for the six majorly affected banks (see Fig. 3). Whilst Citigroup Inc. and Goldman Sachs experienced a slight decrease in credit exposures in Q1 2020, all the other banks saw a sharp increase in exposures during the same period. The largest increase was seen on UBS, whose exposure increased from $562.99 billion to $623.76 billion. Meanwhile, Goldman Sachs experienced the smallest increase from $361.11 billion to $345.67 billion.

To exclude the effect of seasonal movements in exposures, difference-in-difference technology is used. Whilst the difference in exposures between Q4 2019 and Q1 2020 for Citigroup Inc. is less than the one between Q4 2018 and Q1 2019, the difference-in-differences for all the other banks are positive (see Table 2). Taking JP Morgan Chase & Co. as an example, the difference between exposures of Q4 2018 and Q1 2019 is -$19.91 billion, and the difference between exposures of Q4 2019 and Q1 2020 is $62.37 billion, resulting in a difference-in-difference of $82.28 billion. Therefore, the sharp increase in exposures during Q1 2020 was clearly a result of the Covid-19 pandemic.



	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20
BoA	621.01	617.93	628.77	637.17	635.31	719.88
MS	247.49	257.26	275.97	272.34	276.49	290.97
Citi	930.40	939.00	940.50	985.40	1001.50	973.40
UBS	559.98	558.14	546.47	538.49	562.99	623.76
GS	334.53	290.71	300.13	311.07	361.11	345.67
JPM	2108.24	2088.33	2116.94	2128.12	2149.49	2211.86

Fig. 3. Total Credit Exposures for major financial services companies

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

Note: 1. For illustration purpose, data for Bank of America Corporation, Morgan Stanley, Citigroup Inc., UBS Group AG, and Goldman Sachs is illustrated on the primary vertical axis, whilst data for JP Morgan Chase & Co. is illustrated on the Secondary vertical axis; 3. These exposures were calculated through different methods. Therefore horizontal comparisons are meaningless.

Banks	Exposures in 4Q18	Exposures in 1Q19	Difference 1	Percentage Difference1	Exposures in 4Q19	Exposures in 1Q20	Difference 2	Percentage Difference2	Difference-in-Difference
JPM	2108.24	2088.33	-19.91	-0.94%	2149.49	2211.86	62.37	2.90%	82.28
BoA	621.01	617.93	-3.08	-0.50%	635.31	719.88	84.58	13.31%	87.66
MS	247.49	257.26	9.77	3.95%	276.49	290.97	14.49	5.24%	4.72
Citi	930.40	939.00	8.60	0.92%	1001.50	973.40	-28.10	-2.81%	-36.70
UBS	559.98	558.14	-1.84	-0.33%	562.99	623.76	60.78	10.80%	62.61
GS	334.53	290.71	-43.82	-13.10%	361.11	345.67	-15.44	-4.28%	28.37

Table2. Difference-in-Difference analysis of credit risk exposures

Note: 1. Difference1 and Difference2 in the table calculate the difference in exposures between Q4 2018 and Q1 2019, and Q4 2019 and Q4 2020, respectively; 2. The Difference-in-Difference number calculated the difference between Difference1 and Difference2.

The expected loss for the banks resulting from credit risk is calculated as follows:Expected Loss = Probability of Default * Loss Given Default * Exposure at Default.Where Probability of default is the likelihood that a borrower will not be able to meet its contractual obligations; Loss given default is the amount of money a financial institution loses when a borrower defaults on a loan, presented as a percentage of the total exposure. And Exposure at default is the total value a bank is exposed to when a counterparty default;

In the global pandemic situation, the probability of default rises (see Fig. 2), increasing the expected loss for the banks. In addition, the exposure at default also increases (see Fig. 3) during a global pandemic. Along with the increase of the exposure at default, the loss given default, depicted as a percentage of the total exposure at default, moved in the same direction. As a result, the expected loss for the banks may rise exponentially.

Credit exposures can be actively managed and reduced. To control the risk, institutions can adopt several risk management techniques to transfer or hedge the risk:

1. When a new project launched through new business initiatives, banks should assess the new business and the complex transaction with that client. The borrower is often required to pledge assets or property to the bank as collaterals to ensure that in the event of its default, the bank can seize the collateral and sell it to redeem some or all its losses.

2. After the new business initiatives, through monitoring their portfolios and

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

reviewing the portfolios considering market developments, banks can effectively identify any risk limit excesses and start the de-risking process. Temporary risk can be transferred by selling the contract to other institutions or individuals. Banks are also able to use derivatives and insurance to offset their credit risks.

3. Diversification is another useful approach on the firm-wide level. It reduces the variability of loss scenarios and the probability of extreme losses, which are called tail risks. A key to diversifying the banks' exposures is limiting concentrated exposures in the portfolio. Risk concentration occurs when trades are concentrated within a single name counterparty, an industry sector, or a sovereign country. Diversification allows the banks to put eggs in different baskets and thus avoid being hit by counterparty-specific, industry-specific, or country-specific shocks.

4. Market Risk

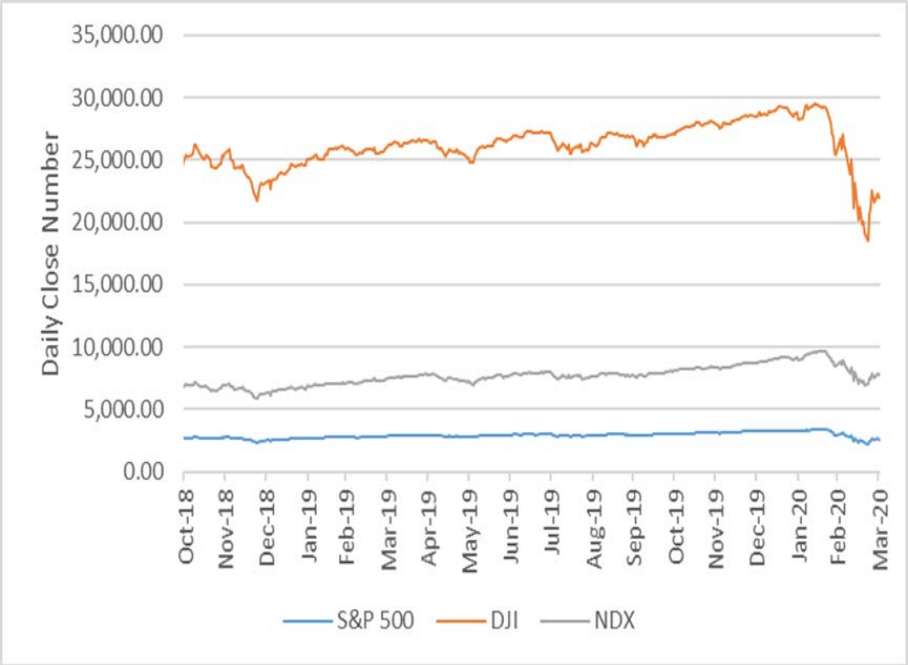
Market risk is the risk of loss resulting from adverse movements in market variables. It includes exposures to two types of risk factors which are general market risk factors and issuer risk. Whilst general market risk factors like stock value, currency level, credit spreads, and interest rate level affect the overall economic or financial market, issuer risk is posed by events affecting a single issuing entity. This section will focus more on the general market risk factors that causing the change in market risk exposures since issuer risk is closely related to credit risk that is described above.

Using the data from Thomson Reuters, S&P 500 Index, Dow Jones Industrial Average Index, and the NASDAQ Composite Index are plotted over time (see Fig. 4). The Covid-19 pandemic together with the oil price war it caused let the stock market become extremely volatile during March 2020. Taking the S&P 500 Index as an example, in January 2020 it decreased by 0.16% from 3230.78 to 3225.52. In the following month, the index dropped a further 8.41% to 2954.22 and then saw the largest fall by 12.51% to 2584.59 at the end of March. Markets became highly volatile due to the great uncertainty of the pandemic, and the economic loss associated with it, such as the loss caused by the oil price war and the lockdown policies.

The interest rate level is another general market risk factor that poses risk to the banks. Using the data from Federal Reserve Board, yields on US treasuries are plotted over time for 3-month US treasury, 1-year US treasury, and 5-year US treasury securities (see Fig. 5). In March 2020, to support the economy during the pandemic, the Federal Reserve announced that it would cut the target interest rate near zero. The market quickly reacted to the announcement, so it can be seen from Fig. 5 that the yield on 3-month treasury bills dropped to a historical low near zero. Banks benefited from decreased interest rates, however, volatility in interest rates could still induce risks on the banks' portfolios.

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

Fig. 4. Daily Close Numbers for major stock markets indices



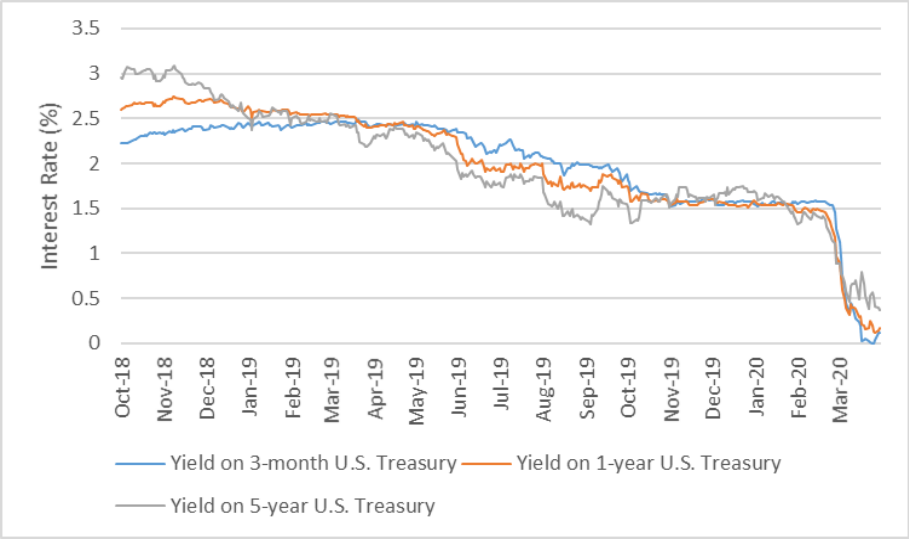


Fig. 5. Yields on US Treasury Securities

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

Normally, banks calculated their market risks using the Value-at-Risk method. With a specific time period and level of confidence, VaR expresses the maximum potential loss of banks' portfolios. Using the data from the market risk section on the banks' investor relations webpages, the total market exposures are plotted over time for the six majorly affected banks (see Fig. 6). All the banks saw a sudden increase in exposures during Q1 2020. The largest increase was seen on Citigroup, whose exposure rose by 78% from $67 million to $119 million. Meanwhile, Morgan Stanley experienced the smallest increase from $39 million to $40 million.

	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20
JPM	41.00	52.00	46.00	39.00	43.00	59.00
BoA	23.00	22.00	20.00	21.00	21.00	28.00
MS	49.00	46.00	46.00	42.00	39.00	40.00
Citi	95.00	81.00	69.00	66.00	67.00	119.00
UBS	11.00	11.00	11.00	12.00	8.00	14.00
GS	49.00	55.00	52.00	58.00	58.00	81.00

Fig. 6. Management VaR of major financial services companies

Note: 1. These exposures were calculated through different methods. Therefore, horizontal comparisons are meaningless.

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Banks	Exposures in 4Q18	Exposures in 1Q19	Difference 1	Percentage Difference1	Exposures in 4Q19	Exposures in 1Q20	Difference 2	Percentage Difference2	Difference-in-Difference
JPM	41.00	52.00	11.00	26.83%	43.00	59.00	16.00	37.21%	5.00
BoA	23.00	22.00	-1.00	-4.35%	21.00	28.00	7.00	33.33%	8.00
MS	49.00	46.00	-3.00	-6.12%	39.00	40.00	1.00	2.56%	4.00
Citi	95.00	81.00	-14.00	-14.74%	67.00	119.00	52.00	77.61%	66.00
UBS	11.00	11.00	0.00	0.00%	8.00	14.00	6.00	75.00%	6.00
GS	49.00	55.00	6.00	12.24%	58.00	81.00	23.00	39.66%	17.00

Table 3. Difference-in-Difference analysis of market risk exposures

Note: 1. Difference1 and Difference2 in the table calculate the difference in exposures between Q4 2018 and Q1 2019, and Q4 2019 and Q4 2020, respectively; 2. The Difference-in-Difference number calculated the difference between Difference1 and Difference2.

To exclude the effect of seasonal movements in exposures, difference-in-difference technology is used (see Table 3). It can be seen from the table that the difference-in-differences for all the banks are positive. Taking Bank of America Corporation as an example, the difference between exposures of Q4 2018 and Q1 2019 is -$1 million, and the difference between exposures of Q4 2019 and Q1 2020 is $7 million, resulting in a difference-in-difference of $8 million. Therefore, the sharp increase in exposures during Q1 2020 was clearly a result of the Covid-19 pandemic.

Market risk can also be measured by modeling stress scenarios and estimating tail loss. Scenarios may be based on historical events like the 2008 financial crisis, or they may be forward-looking.

Market risk exists because of price changes. For the banks to hedge market risk and to protect their portfolios against volatility, banks can adopt several hedging strategies, one of which is using options. For banks with large, well-diversified portfolios, index options could be used. During a period with high volatility, such as the Covid-19 pandemic, stocks in the markets tend to move in the same direction. Under such circumstances, put options would be useful to hedge market risk. In addition, the Volatility Index indicator is also a powerful tool. VIX measures the volatility of the put and call options on the S&P 500 index, rising with increased volatility. However, market risk cannot be eliminated since some of the exposures are caused by systemic market factors.

6. Risk-Weighted Assets

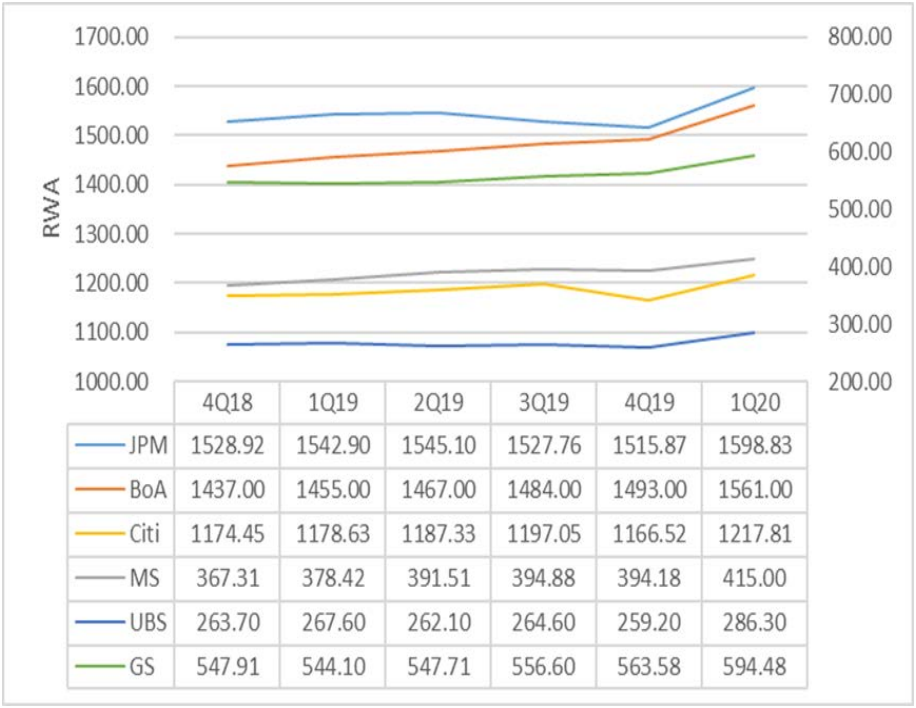
Risk-weighted assets are calculated as required by the regulators. It is used to determine the minimum amount of capital that must be held by financial institutions to reduce their risk of insolvency. Each bank should classify its assets together by risk category so that the amount of required capital is matched with the risk of each asset type. Normally, banks report their RWA figures by credit risk, market risk, and

ISSN 2616-7433 Vol. 2, Issue 14: 133-146, DOI: 10.25236/FSST.2020.021417

operational risk. Therefore, RWA could also be used as an indication of the banks' risk level. The individual exposures for credit risk and market risk have been discussed in the above sections, and the risk-weighted assets can be considered the total risk exposures for the banks.

Using the data from the RWA section on the banks' investor relations webpages, the total RWAs are plotted over time for the six majorly affected banks (see Fig. 7). All the banks saw an unexpected increase in RWA figures during Q1 2020. The largest increase was seen on JPMorgan, whose exposure increased from $1515.87 billion to $1598.83 billion. Meanwhile, Morgan Stanley experienced the smallest increase from $394.18 billion to $415.00 billion.

To exclude the effect of seasonal movements in exposures, difference-in-difference technology is used. The difference-in-differences for all the banks are positive (see Table 4). Taking JP Morgan Chase & Co. as an example, the difference between exposures of Q4 2018 and Q1 2019 is $13.99 billion, and the difference between exposures of Q4 2019 and Q1 2020 is $82.96 billion, resulting in a difference-in-difference of $68.97 billion. Therefore, the sharp increase in the banks' RWAs during Q1 2020 was clearly a result of the Covid-19 pandemic.



	4Q18	1Q19	2Q19	3Q19	4Q19	1Q20
JPM	1528.92	1542.90	1545.10	1527.76	1515.87	1598.83
BoA	1437.00	1455.00	1467.00	1484.00	1493.00	1561.00
Citi	1174.45	1178.63	1187.33	1197.05	1166.52	1217.81
MS	367.31	378.42	391.51	394.88	394.18	415.00
UBS	263.70	267.60	262.10	264.60	259.20	286.30
GS	547.91	544.10	547.71	556.60	563.58	594.48

Fig. 7. RWA major financial services companies

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Note: These exposures were calculated through different methods. Therefore, horizontal comparisons are meaningless.

Banks	Exposures in 4Q18	Exposures in 1Q19	Difference 1	Percentage Difference1	Exposures in 4Q19	Exposures in 1Q20	Difference 2	Percentage Difference2	Difference-in-Difference
JPM	1528.92	1542.90	13.99	0.91%	1515.87	1598.83	82.96	5.47%	68.97
BoA	1437.00	1455.00	18.00	1.25%	1493.00	1561.00	68.00	4.55%	50.00
MS	367.31	378.42	11.11	3.02%	394.18	415.00	20.83	5.28%	9.71
Citi	1174.45	1178.63	4.18	0.36%	1166.52	1217.81	51.28	4.40%	47.10
UBS	263.70	267.60	3.90	1.48%	259.20	286.30	27.10	10.46%	23.20
GS	547.91	544.10	-3.81	-0.69%	563.58	594.48	30.91	5.48%	34.71

Table 4. Difference-in-Difference analysis of RWAs

Note: 1. Difference1 and Difference2 in the table calculate the difference in exposures between Q4 2018 and Q1 2019, and Q4 2019 and Q4 2020, respectively; 2. The Difference-in-Difference number calculated the difference between Difference1 and Difference2.

7. Conclusions

This paper provides a quantitative analysis of the pandemic risk for financial services companies, using Covid-19 as the model case. The pandemic and its aftermath have claimed hundreds of thousands of lives and have been causing unprecedented market movements. The total risk exposures for the major bulge bracket banks have increased dramatically during the first quarter of 2020, and the increase is clearly linked to the pandemic outbreak. Banks have responded to the risk increase by transferring their risks, using hedging strategies, and asking for more collaterals.

The Covid-19 pandemic is an important lesson for all the financial markets players to learn their strengths and weaknesses in a global pandemic situation. Banks should focus on their future positions, and construct a comprehensive plan considering coping with a serious stress event. It is also the government's and central banks' responsibility to establish policies to support the economy and financial systems and to boost economic growth.

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