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RESEARCH ARTICLE

OPERATION OF INTERNATIONAL FINANCIAL CENTERS DURING THE PANDEMIC

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Abstract

The rapid spread of coronavirus (COVID-19) has dramatic impacts on financial markets all over the world. It has created an unprecedented level of risk, causing investors to suffer significant losses in a very short period of time. This paper aims to map the general patterns of country specific risks and systemic risks in the global financial markets and financial markets. It also analyses the potential consequence of policy interventions, such as the US’ decision to implement a zero-percent interest rate and unlimited quantitative easing (QE), and to what extent these policies may introduce further uncertainties into global financial markets. This paper highlights the enormous economic and social impact of COVID-19 with respect to articles that have either prognosticated such a large-scale event, and its economic consequences, or have assessed the impacts of other epidemics and pandemics. A consideration of possible impacts of COVID-19 on financial markets and institutions, either directly or indirectly, is briefly outlined by drawing on a variety kinds of literatures. A consideration of the characteristics of COVID-19, along with what research suggests have been the impacts of other past events that in some ways roughly parallel COVID-19, points toward avenues of future investigation. This paper offers an informed commentary on the actual and potential impacts of the pandemic on financial markets, sector and centres, grounded in literature on financial centres, the state-finance nexus, and trends affecting the landscape of finance since the global financial crisis. We expect a slowdown in new financial regulation, continued firm-level consolidation, and a continued rise of business services related to finance. The application of new financial technologies is likely to accelerate, affecting retail banking in particular, but will not necessarily be led by FinTech firms. Local and regional financial centres are likely to face larger challenges than leading international centres. As the panic and partial recovery in financial markets in March and April 2020 highlighted the significance of the international monetary hierarchy, with the US\$ in the lead, a radical shift of financial power to Asia seems unlikely.

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Introduction:-

On 11 March, 2020, the World Health Organization (WHO) officially declared the coronavirus (COVID-19) outbreak to be a global pandemic¹. As of 27 March, 2020, the number of confirmed cases surpassed 500,000, and it continues to rise (WHO, 2020). Over 170 countries are affected, with the US has the most confirmed cases. The outbreak has had clear significant economic impacts. In the short-term, as many countries adopt strict quarantine policies, their economic activities are significantly limited. The longer-term consequences of this pandemic may arise from mass unemployment and business failures. Some industries, such as tourism and aviation, will certainly face hardships. While the exact global economic impacts are not yet clear, financial markets have already responded with dramatic movements. In March 2020, the US stock market hit the circuit breaker mechanism four times in ten days. Since its inception in 1987, the breaker has only ever been triggered once, in 1997. Together with the US crash, stock markets in Europe and Asia have also plunged. FTSE, the UK's main index, dropped more than 10% on 12 March, 2020, in its worst day since 1987.² The stock market in Japan plunged more than 20% from its highest position in December 2019.³ Central banks and authorities responded immediately by throwing their policy instruments into the market. For example, on 15 March, 2020, the Federal Reserve (FED) announced a zero percent interest rate policy and at least a \$700 billion quantitative easing (QE) program. Following the negative responses to this policy in the market, the FED announced an unlimited QE policy eight days later. Although most stock markets have recently begun rebounding, a great deal of uncertainty remains as the pandemic continues.

In Day-60 ($\Delta\tilde{Y}^{\text{Wuhan}} = 0.45$) ($\tilde{G}_1 = 1.10$), coronavirus crossed the Chinese borders. Singaporean and Malaysian governments announced a 4.5 billion-dollar and a 20 billion-ringgit fiscal stimulus packages, respectively. S&P 500 had been experiencing a market correction, erasing the profits of the trade deal between the United States and China. The economic consequences of the pandemic are becoming obvious in the American economy. The unemployment rate remains at a 50-year low of 3.5 percent, but in the last two weeks of the month, almost 10 million people applied for unemployment benefits. With Covid-19 accelerating throughout the country, investor sentiment has been fueled by uncertainty about the economic consequences of getting the pandemic under control, which was translated into excess market volatility. The Federal Reserve announced a benchmark rate cut by one percent and an injection into the financial markets of 1.5 trillion dollars in the form of treasury and mortgage-backed securities. At the end of the month, the overall picture shifted when Trump administration announced an initial 2.2 trillion-dollar economic recovery package to be distributed to millions of American citizens in the form of cash backs, loans, grants and tax breaks for businesses.

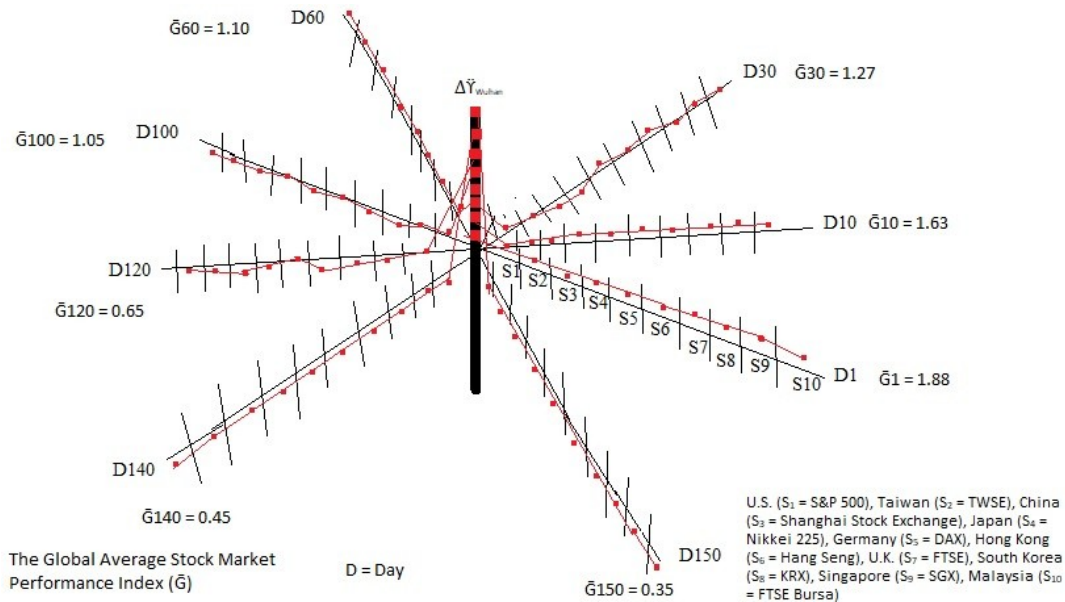
In Europe, there have been rapidly growing numbers of severe and fatal cases in many EU/EEA countries, and several countries in Europe have already reported nationwide community transmission. Italy, Spain, France and the Netherlands have already reported healthcare system saturation due to very high patient loads requiring intensive care. Stock markets have plummeted: France, -17.21 percent; Germany, -16.44 percent; the United Kingdom, -13.74 percent and; Italy, -22.85 percent. The European Central Bank announced to inject 780 billion euros into financial markets and refinancing options for the private sector of 3 trillion euros. In the United Kingdom, the Bank of England proceeded to interest rate cuts whereas the government announced expansionary measures of 30 billion pounds. Germany will launch a stimulus package of 750 billion euros to support the local economy.

In Day-120 ($\Delta\tilde{Y}^{\text{Wuhan}} = 0.55$) ($\tilde{G}_{120} = 0.65$), stock markets officially become bearish. Every economic assumption that seemed valid a month ago is now being reevaluated, and is being revised downward. Stock prices reflect expectations of future profits, and investors see the virus dampening economic activity and reducing profits. According to the ϕ -Simulator in Day-140 is possible to get a $\tilde{G}_{140} = 0.45$ under ($\Delta\tilde{Y}^{\text{Wuhan}} = 0.65$) and a pessimistic result of in Day-150 ($\Delta\tilde{Y}^{\text{Wuhan}} = 0.85$) ($\tilde{G}_{120} = 0.35$) under the assumption that we arrive to the maximum damage of Covid-19 and suddenly the Covid-19 is under control and exist a possible vaccination worldwide.

Intuitively, the pandemic aftermath will be uncharted territory for the world economies and financial markets. It is a plausible conjecture that the world economy may experience a new economic phenomenon, so-called by authors as a *staggression*, a situation where recession overlaps depression causing structural economic deconstruction. It will present a dilemma for economic policy since expansionary actions intend to boost economic activity through monetary and fiscal stimulus would be inefficient if economies cross their sustainability threshold level. The structural resilience of an economy depends on its level to absorb the impact of economic lockdown without affecting business and employment viability. If the economy's sustainability level is crossed, production, consumption and wealth will plummet; then it will be required a revitalization of the economy. Revitalization

involves restoring the flow of goods and services within the country and across the border, through infrastructure, private sector, human capital, and financial sector development. In particular, the implementation of place-based policies will focus to rebuild local economies, create new employment opportunities and ensure sufficient financial assistance for the displaced, unemployed, under-employed, and new entrants. Consumer spending constitutes 50 to 70 percent of GDP and it has to be restored in its default values. Empirical evidence shows that previous episodes of financial crises were characterized by gradual unfavorable supply and demand shocks with medium- and short-term effects in output and in employment. In the case of stagflation, the epidemic impact on economic activity differs in terms of magnitude and intensity: an economy experiences a supply and demand shocks in the short-run with instant effects in output and employment. In contrast to previous financial crises, the impact on demand is doubled: imports and exports will contract.

Figure 4:- The ϕ -Simulator Final Results from 10 Stock Markets.



Source: WHO (2020), S&P 500 (2020), TWSE (2020), Shanghai Stock Exchange (2020), Nikkei 225 (2020), DAX (2020), Hang Seng (2020), FTSE (2020), KRX (2020), SGX (2020), FTSE Bursa (2020).

The disruption of global economic production due to the shutdown of China-centric global supply chains generated output shortages on intermediate and final goods. Even if the Chinese government introduces an infrastructure spending program to restore its pre-pandemic production capacity, this effort will not be followed by pre-pandemic demand levels. In parallel, export dependence and export concentration economies in durable goods, mining and oil production will be severely hurt, shifting from a short-term recession to a medium and -maybe- a long-term depression by the end of 2020. In contrast, agriculture sector economies will enforce restrictions or even ban exports in an attempt to secure domestic demand first, triggering major trade disruptions in the complex food value chain: production, processing, packaging, storage, transportation, and retail sales. Domestically, tourism, transportation, entertainment, retail, and small businesses are divested followed by durable goods value chain. Logically, some sectors may benefit, such as e-commerce, food retail, and the healthcare industry - providing at least some economic growth to offset the damage.

Method of the research:-

Daily data up to 27 March, 2020 were collected to explore the patterns of stock market reactions. The indexes for all stock markets across the world were downloaded from investing.com. All the data on the global coronavirus infections are from John Hopkins Coronavirus Resource Center.

Volatility Analysis:

The first task is to illustrate the relationship between stock market risks and the outbreak of COVID-19. Countries on the top 10 list of confirmed cases have been selected (according to the data on 27 March, 2020) together with

Japan, Korea and Singapore. Iran is excluded from this list, as its stock market data are not available. Together, these countries have had 466,693 cases (see Table 1); they all have well-developed stock markets. Market risk is calculated using standard deviations of daily returns. The WHO declared PHEIC status in China on 30 January, 2020, so only February and March are considered in the present analysis. For most of February, China was the centre of the outbreak. While China successfully contained the virus from early March, the confirmed cases in Europe and the US have started to shoot up. The statistics reported in Table 1 confirm that the pandemic has had a strong influence on stock markets. The risk levels of all the countries has increased substantially, from an average of 0.0071 in February to 0.0196 in March. Such dramatic movement cannot simply because of long-term expectations (Gormsen and Koijen, 2020), instead, it is almost certain that sentimental factors play important roles. The market sentiment in response to the outbreak can be quickly amplified through social media, which then stimulate trade activities and cause extreme price movements (Broadstock and Zhang, 2019). Not surprisingly, China has had the highest level of standard deviation in February and the lowest in March. The US' market volatility has increased the most, with a level of standard deviation in March nearly four times higher than that in February. Interestingly, the standard deviation ranking in March is roughly consistent with the ranking of confirmed cases (excluding China). It is clear that the pandemic has led to great risk and uncertainty in the global financial markets.

Correlation Analysis:

Being a global health crisis, one would expect to see not only a rise in country-specific risks in stock markets, but also an increase in systemic risks. Here, correlations are used to illustrate the systemic reaction to the pandemic. Fig. 2 plots weekly return correlations among these 12 countries. They are calculated based on daily data within each week between February and March, totally eight observations.

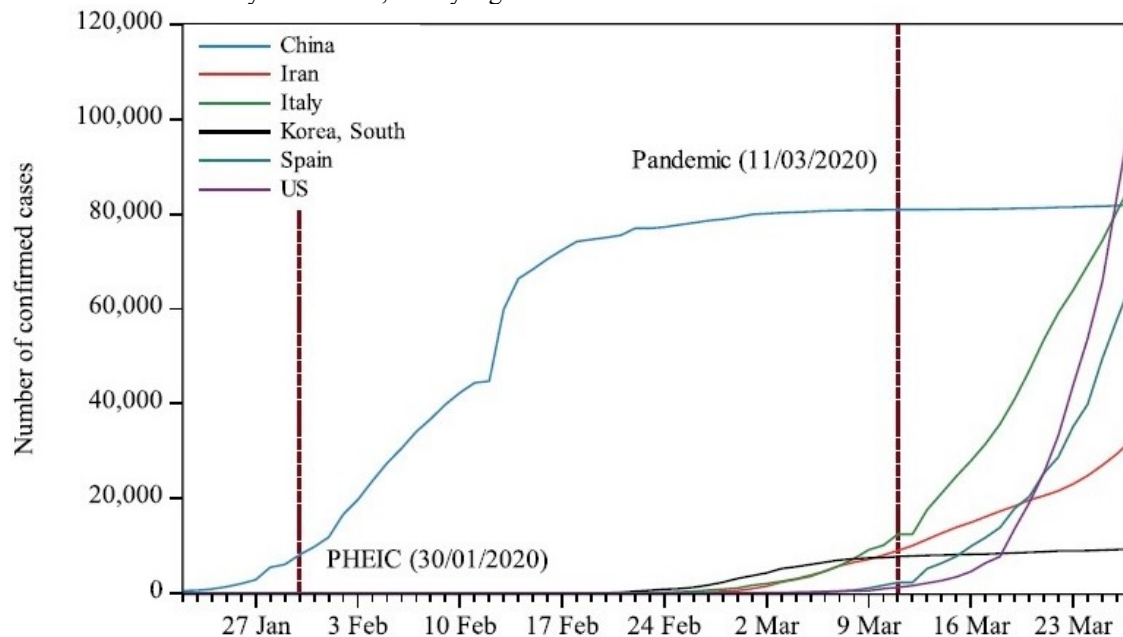


Fig. 1:- Confirmed cases in major affected countries. (<https://coronavirus.jhu.edu/>).

Table 1
Confirmed cases and market volatility

Country	Confirmed cases on Feb/29/20	Confirmed cases on Mar/27/20	Std_February	Std_March	Rank 01	Rank 02
US	68	101657	0.0069	0.0268	7	1
Italy	1128	86498	0.0083	0.0258	2	2
China Mainland	79261	81378	0.0098	0.0084	1	12
Spain	45	65719	0.0074	0.0234	4	3
Germany	79	50871	0.0073	0.0212	5	5
France	100	32964	0.0069	0.0221	8	4
United Kingdom	23	14543	0.0064	0.0198	11	6
Switzerland	18	12928	0.0067	0.0172	9	9
Korea, South	3150	9332	0.0069	0.0189	6	8
Netherlands	6	8603	0.0074	0.0192	3	7
Japan	241	1468	0.0065	0.0164	10	10
Singapore	102	732	0.0050	0.0159	12	11
Total confirmed	84221	466693				
Average Std.			0.0071	0.0196		

The correlations in February are relatively low, but they increase substantially upon entering March. The highest level appears in the week ending on 6 March, 2020 when Europe and the US starting to lose control, prompting the WHO to announce a pandemic during the weekend (11 March, 2020). The correlation in the week ending on 20 March, 2020 is surprisingly low.

Note: The countries are selected and ranked according to John Hopkins Coronavirus Resource Center; they are the top 10 infected countries by number of confirmed cases (together with Japan, South Korea and Singapore). Iran is not included due to the unavailability of its stock market data. Std_February and Std_March are the standard deviations of daily returns in February and March, respectively. Rank 01 is the country ranking according to Std_February. Rank 02 is the country ranking according to Std_March.

It is obvious that investors around the world had different opinions of the US' zero-percent interest rate policy, until the new unlimited QE was announced in the following week. Although there is a worldwide market rebound in the week after, driving higher correlations, the long-term impacts of the US' policies remain unclear. Using the WHO's announcement of a pandemic as a breaking point to separate the sample, two heat maps show the correlations before the announcement and after are plotted. While the US and the European stock markets keep high correlations in both cases, the four stock markets in Asia behave quite differently. While only China is somehow isolated from the world before the announcement, the whole Asia group is moving away from the Europe-US group. They become more connected after the announcement (the darker blue colour). For example, South Korea is highly correlated with China and Singapore after the announcement, but not before.

Results:-

The ongoing COVID-19 pandemic is one of the biggest crises of modern times. In contrast to the global financial crisis (GFC) of 2008 which started in New York, the pandemic started near a meat market in Wuhan in central China, in December 2019. While some economists have stressed that in a stark contrast to 2008 the ongoing crisis is exogenous, with sources detached from economic fundamentals (see e.g. Lagarde 2020), the sources of zoonotic pandemics are affected by human relationships with and interventions in nature, such as intensive animal farming or meat markets. Moreover, while the GFC spread around the world through international financial and economic connections, globalization has helped to turn COVID-19 into a pandemic through international travel. In this sense, the ongoing COVID-19 crisis is endogenous, and could have been expected (e.g. Woolhouse *et al.* 2016). Whereas the GFC is sometimes referred to as the North Atlantic crisis, the COVID-19 pandemic is truly global, directly affecting almost every country in the world. In order to protect lives of their citizens and halt the spread of the virus, governments of most countries have decided to shut down schools, public spaces and lock people down in their homes, effectively hibernating large parts of the economy. Cross-border movement of people and goods have been severely restricted. At the time of writing this paper (early May 2020), the duration, scope and death toll of the pandemic are uncertain, and so are its economic consequences. Roubini (2020) foresees a global crisis which will at best be deeper than the 2008 recession but short-lived, and at worst will turn into a persistent L-shaped depression. The OECD (2020a) foresees an immediate decline of GDP by 20 per cent to 25 per cent in most advanced economies due to the direct impact of lockdowns. Standard and Poor's (S&P) anticipates a U-shaped recovery, with uncertainty regarding the duration of the bottom part of the U (S&P 2020).

There is also a threat that liquidity problems experienced by households, businesses, and public sector organizations, will lead to a chain reaction of non-performing loans, insolvencies and bankruptcies, sending the global economy into a vortex of financial and economic crises. The objective of this paper is to offer an informed commentary on the actual and potential impacts of the pandemic on financial markets, sector and centres. I will ground my analysis and discussion in three strands of research on economic and financial geography. First of all, I build on established literature on financial centres. We consider financial centres as concentrations of financial and business services (FABS). Beyond the financial sector itself, these include accountancy, corporate law, business consulting, and IT services related to finance, all of which are essential to financial transactions (Wyjck 2018). The landscape of financial centres can be understood as the outcome of an interplay between centripetal and centrifugal forces (Verdier 2003). Localisation and agglomeration economies act as powerful centripetal forces. Access to local customers, their money and information, as well as labour, land and energy cost reduction pull financial centres apart. Technology enables the unbundling of FABS value chains with front office, back office and data centres in different locations, in addition to a variety of jurisdictions in which financial vehicles and contracts are registered (Haberly & Wyjck 2015; Kleibert 2020).

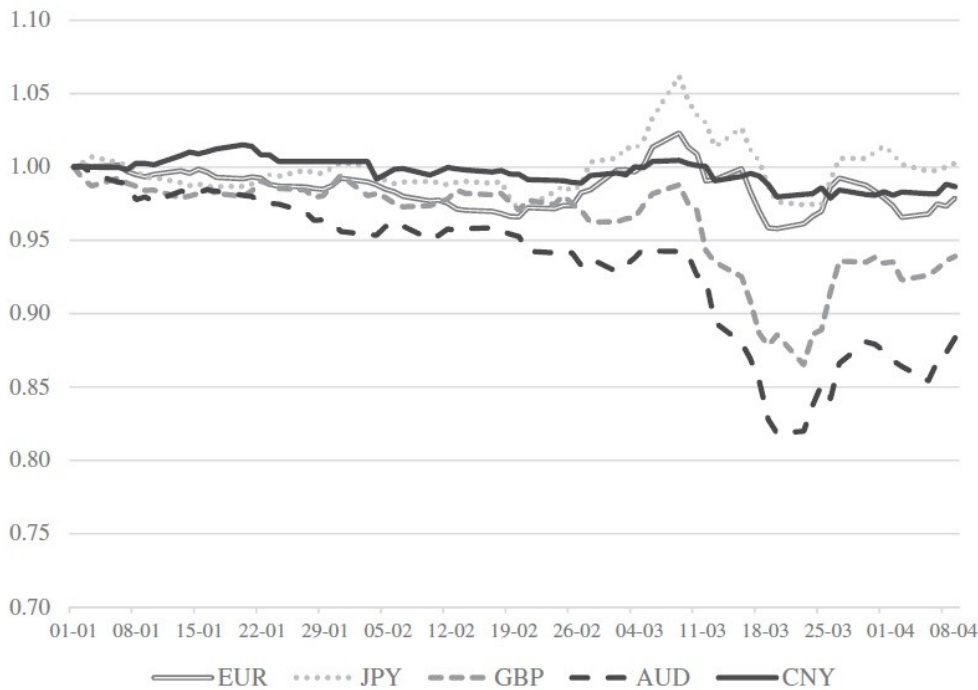
The second strand of literature focuses on the relationship between state and finance. The state enables the existence and operation of a financial system through money, law and regulation. It shares the creation of money (including credit money) with private banks, and controls it through monetary policy. Finance is made in law, as the former could not exist without the protection of private property and the enforcement of financial contracts (Pistor 2018). Regulation, combined with law, further affects the modus operandi of the financial system, but beyond that they directly create some parts of the FABS complex, such as corporate law, audit or tax services. One manifestation of the state-finance relationship internationally is the monetary hierarchy (Kaltenbrunner & Paineira 2016) or currency pyramid (Cohen 2000), with US\$ in the lead, as a currency dominating financial and economic transactions globally. Its power is underpinned by the political and economic might of the US, the size and depth of US financial markets, and a global network of traders (with US banks in the lead) using US\$. Another major manifestation is offshore finance driven by legal and regulatory arbitrage (Aalbers 2018). Finally, we will rely on a rich body of research on the evolution of the international financial system since the GFC. This literature has focused on several major trends. First, the GFC unleashed a wave of new financial regulation. The initial plans to redraw the global financial architecture have been watered down, due to the prevailing economic orthodoxy and opposition from the financial sector (Ioannou *et al.* 2019). Nevertheless, among other measures, capital requirements for banks have increased, and trading of some financial instruments has been brought from over-the-counter markets to exchanges. Second, the financial sector has seen a lot of consolidation, with failing companies being acquired by others, often in transactions arranged by government (Wyjck & MacDonald-Korth 2015). At the same time, a new generation of financial technology called FinTech has emerged, with an industry of start-ups using online platforms, blockchain, AI and other technologies to challenge the existing business models in the financial sector (Hendrikse *et al.* 2019). Fourth, although employment in the financial sector itself has stagnated in many parts of the world, not least due to the introduction of new technologies, other business services, including accountancy, corporate law and business consulting have seen a major growth of employment (Cassis & Wyjck 2018). Finally, while some expected the GFC to trigger a major shift of financial centres and power to Asia, this has happened only slowly and tentatively (Hall 2016; Wyjck *et al.* 2018, 2019). Putting these strands of literature in the context of the COVID-19 pandemic leads to a myriad of questions. In this commentary, we will focus on four interrelated issues. How has the pandemic manifested itself in financial markets so far? How could it influence the financial sector and financial centres? What is the role of the state in these actual and potential developments? And finally, how do they compare with the trends that have affected finance and its geography since the GFC? Could the pandemic stop, reverse or accelerate any of these trends? In tackling these questions, we will be using recent economic and financial data, as well as insights from commentaries and reports by public and private financial institutions. We will start by reviewing the developments in financial markets, taking into consideration the economic policy responses that have affected these developments. This will give us a basis, on which to build our expectations regarding potential impacts of the pandemic on the financial sector and financial centres.

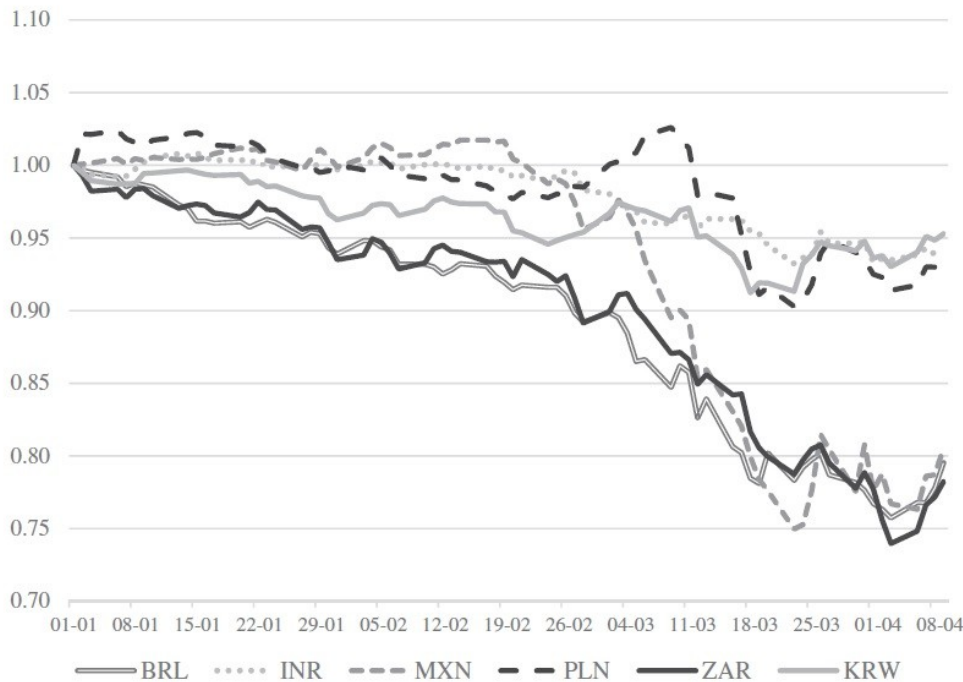
Financial Centers' Developments To Date:

In financial markets the pandemic triggered a flight to liquidity or a 'dash for cash' with sales of risky assets for cash and purchases of less risky assets (Gros 2020). In currency markets this took the form of a flight to US\$. As Figure 1 shows all 11 selected currencies lost value in relation to the US\$ since the start of the year. CNY almost maintained its value, but it is the only of the selected currencies that does not have a floating exchange rate. Among the floating currencies, JPY and EUR lost least value, and AU\$ most, with GBP in between. On 20 March, GBP traded at

US\$1.15, its lowest value since 1985. The price of AU\$ is likely to have been adversely impacted by declining prices of commodities, a major source of Australia’s export revenues. Among emerging market currencies KRW, PLN and INR followed closely the depreciation of strong currencies such as the GBP. BRL, MXN and ZAR lost a third of value. The former group includes relatively advanced economies of South Korea, which managed to contain the spread of the virus early on, and Poland, which introduced quite strict containment measures as well. These two countries, as well as India, do not rely on commodity exports, in stark contrast to Brazil and South Africa. In addition, Brazil’s President has gained a reputation for denying the severity of the crisis. As for timing, the currency market was calm until early March, long after the WHO declared a global health emergency on 30 January. The major flight to US\$ started on 12 March, the day after President Trump announced unprecedented restrictions on travel from most European countries. This wave of US\$ appreciation lasted until 23–24 March. Then the US\$ fell and stabilized around the end of month. Stock markets started to decline on 20 February, with a parallel fall in all major markets (Figure 2). Over the following 4 weeks, stock markets lost between a third and 40 per cent of value, with the pace of decline faster than in 1929 (Goldman Sachs 2020). On 9 March, market losses were so large that they triggered a market-wide circuit breaker on the NYSE, for the first time since 1997. The markets started to rise again around 23 of March, in line with the end of a flight to US\$.

Figure 1:- Change in the value of selected currencies in relation to US\$, 1 January to 9 April 2020.





This highlights the interconnectedness of financial markets and marks the end of a wave of panic sales of risky assets, and a flight to liquidity, which may not be the last one, of course. While all curves in Figure 2 have common inflection points, the impact of the pandemic, as gauged by the depth of the decline, differs significantly between countries and groups of companies. As China seemed to halt the spread of COVID-19 already by late February, and the lockdown has been gradually eased since then, Chinese stock market declined least, and in early April was already trading at over 92 per cent of its start of the year level (Figure 2). One should keep in mind, however, that the performance of the Chinese stock market is influenced heavily by the Chinese government, which controls many listed companies. The US and Japanese stock markets performed much better than that in the Eurozone. The UK stock market did worse than the Eurozone. With China as a major exception, however, emerging and frontier markets suffered much larger losses than those in developed markets (Figure 2).

This may be due partly to the negative effects of falling commodity prices on developing countries, which rely much more on commodity exports (Stiglitz 2020). Size seems to be a major factor shaping the impact of the pandemic on business. Stock prices of companies with large market capitalization (large caps) performed better than mid caps and much better than small caps (Figure 2). This is not usual, as over the last 10 years small and mid caps outperformed large caps, in accordance with the expectation that higher risk assets should in the long run offer a better return than low risk assets. However, it seems that markets perceive size as a factor sheltering firms in the current conditions. The pattern of decline and partial recovery in financial markets can be interpreted by considering the spread of the pandemic and economic policy responses by major governments, which have been chronicled brilliantly by Adam Tooze (2020). Both stock and currency markets remained quiet until 20 February, seemingly in the belief that the pandemic could be managed without major economic consequences. However, with the growing number of infections and deaths in Continental Europe, particularly in Italy, stock markets started sliding, with investors moving money away from stocks and putting them in safer assets like bonds. In early March, the US and UK governments were downplaying the threat of the pandemic, while foreign exchange markets, concentrated in London and New York, remained rather unmoved as well.

Potential Impacts On The Financial Sector And Financial Centers:

As shown in the preceding section, financial markets have had a major impact on the timing and scale of economic policy interventions. Monetary policy measures in turn have focused on quantitative easing, with major injections of liquidity into the financial sector, and on some occasions into the non-financial corporate sector. This emphasis on helping the financial sector and the prices of financial assets, is reminiscent of central bank policies during the GFC, and reflects close relationships between central banks and financial market players, and government and financial

elites in general (Engelen *et al.* 2011). One way to gauge the potential impact of the pandemic on the financial sector is to compare sectoral stock market indices (Table 1). Not surprisingly, there are large differences between the performance of different sectors, even though all indices declined. Health care did best, losing 10 per cent globally since the start of the stock market fall on 20 February. On the other end of the spectrum, affected by falling oil and gas prices, the energy sector globally lost 33 per cent. Real estate transactions are not popular in conditions of fundamental uncertainty, and almost impossible with lockdowns, with stocks in the industry falling by 24 per cent globally. Financials (made of banking, insurance, and diversified financial firms) have been the second most badly affected sector with a fall of 27 per cent. In Table 2 we collated information on the change in stock prices for selected subsectors and individual firms in finance and related industries. Insurance firms, particularly large ones like UnitedHealth Group and Berkshire Hathaway, have been affected by the pandemic less badly than banks. Of course, in the short run, they face lower investment returns on the revenue side, and higher costs in the form of premia to be paid to individuals and companies impacted by the crisis. There are likely to be many costly disputes between insurers and the insured about the nature of interruptions caused by the pandemic and their implications for insurance contracts. In the long run, however, with increased awareness that a pandemic represents a major risk, and one with much higher probability than hitherto assumed, demand for insurance is likely to rise. After SARS, insurance companies expanded the use of exclusion clauses for pandemic risks. After Coronavirus they may become even more popular. At the same time, there will be pressure on insurers from both consumers and governments to offer comprehensive and simple solutions (Allianz 2020). Banks entered the pandemic better capitalized than in the run-up to the global financial crisis of 2008. On average, the 'naked' capital adequacy ratio (actual equity to total assets) of the four banks listed as the most 'globally systemically important' by the Financial Stability Board (JP Morgan, Citigroup, HSBC, and Bank of America; see FSB 2019) has increased from 6.9 per cent in 2007 to 9.4 per cent in 2019 (S&P Global). At the same time, governments and central banks, having prevented the immediate financial panic from spiralling out of control, seem acutely aware of the need to prevent the emerging recession from triggering a financial crisis. Nevertheless, in addition to facing the huge challenge of non-performing debt, the pandemic is likely to accelerate the digitisation of banking, which will affect retail banking much more than the wholesale part of the industry, including investment banking. Thus far, at least, investment banks have lost much less of their market value than more retail-oriented banks (Table 2). The pandemic can accelerate changes in consumer behavior. Bank branches may stay open in many countries, but people (particularly non-millennials) have certainly been forced to use digital banking more, and give branches and ATMs a miss. When all social distancing and mobility restrictions are lifted, people are much more likely to continue using digital channels of accessing financial services. Second, the governments are likely to ramp up their support for digital finance, as one of the ways of building more digitised and resilient economies. Banknotes and coins do not only help the black and grey economy and hence tax evasion; now their unhygienic character will also be given much more attention. To be sure, the state of digital transformation in finance varies greatly from country to country, not necessarily in much correlation with their level of economic development. In 2018 in South Korea 86 per cent of payments were made in cash, while in Japan only 18 per cent (Buchholz 2019). The pandemic is thus likely to lead to significant changes in the provision of financial services, with retail banking in the lead. Whether the development and application of new financial technology favours incumbent banks, as they enhance their digital banking strategies, FinTech start-ups or big technology firms entering the realm of finance will depend on many factors, including regulation, and can differ from place to place. Despite growing demand for their technological solutions, a major challenge facing FinTech firms is their relatively small size and hunger for investments and cash, which will not be easily satisfied during the looming recession. The FinTech startup death rate is bound to be much higher than ever before, as the industry, which emerged in the wake of the GFC, has not yet been tested by an economic crisis. In this respect, large incumbent banks and big tech firms, the latter hoarding massive cash reserves, will have an advantage over FinTech firms. Consider large valuation losses suffered by specialised listed FinTech firms such as Square, Global Payments and Guidewire Software, in relation to smaller losses of established financial infrastructure firms like Visa and Mastercard and big tech firms like Amazon, Facebook and Alibaba. As we stressed in the introduction, the key tenants of financial centres are not only banks, insurance companies, and increasingly FinTech firms, but also professional and other advanced business services, with corporate law, accountancy and consulting in the lead (Cassisi & Wycik 2018).

In my view, demand for corporate legal services is likely to remain strong. The pandemic has disrupted business, triggering the need to renegotiate contracts. Imagine, for example, a company running a shopping mall in need to review their contracts with retailers. There are legal issues related to employees working from home. Firms going bankrupt or restructuring themselves also generate demand for corporate legal services. Accountancy firms, in turn, will be busy helping companies account for the impacts of the pandemic on their financial statements, and disclosing

these impacts accordingly. Consulting firms will see demand for services related to corporate restructuring, digitisation, supply chains, and other projects. Resilience is bound to be one of the buzzwords used by these firms in their advisory activities (McKinsey 2020). Arguably, as the pandemic poses challenges to all areas of corporate life, from accounting and legal, through IT, to supply chains, Big Four firms, which can offer a 'one-stop-shop' for all these services, seem poised to capitalise on the pandemic-induced demand. While none of the Big Four firms is publicly traded and has a stock price, the relatively mild value losses of Accenture and Marsh & McLennan may be indicative in this regard. Since the global financial crisis, in many financial centres of developed economies, employment in the financial sector has decreased, but this has been more than compensated by the growth in other professional and business services. This trend is likely to continue, with healthy demand for these services, relatively unthreatened by FinTech. The larger stock market losses of smaller firms, and the fact that the impact of the pandemic is on average likely to be even worse for unlisted SMEs, as they have limited access to capital markets and have to rely on bank loans, suggest that the pandemic will accelerate the trend towards more consolidation in the financial sector, a trend compounded by economies of scale released by new technology. This is a reasonable, though perhaps somewhat self-serving, prediction of Larry Fink (2020), the CEO of Blackrock for the future of asset management, and one confirmed by a recent study of the sector, focusing on the role of platform economies (Haberly *et al.* 2019). Accelerated transition to digital finance, including the trimming of branch network is bad news for small regional and local financial centres focused on face-to-face contact with retail customers and SMEs. To be sure, the demise of bank branches has been predicted for decades, so even an acceleration of this trend implies a gradual process rather than a radical transformation.

Discussion:-

Financial centers during pandemic :

We are all now tragically familiar with the ongoing enormous costs in lives of the COVID-19 pandemic. We are all additionally fearful of the eventual economic impact of the crisis, including the impact on financial markets. At the time of writing this article this pandemic is ongoing, with the eventual scale of the disaster still unknown. However, it is reasonable to expect a great deal of interest in the very near future on the role of pandemics in finance. This brief article is anticipatory, sketching the scant research, yet, on pandemics and finance, as well as suggesting partial parallels with other more-explored areas of financial economics research. Recent academic articles, along with assessing the impacts of past epidemics and pandemics, also eerily prognosticate large-scale events such as COVID-19, and its economic consequences. A consideration of possible impacts of COVID-19 on financial markets and institutions, either directly or indirectly, is briefly outlined by drawing on a variety of literatures. Examining what research suggests have been the impacts of past events that in some ways roughly parallel COVID-19, alongside a consideration of how COVID-19 may be different, suggests avenues of future investigation

Economic impact of pandemics:

An obvious way that pandemics can impact financial systems is through their enormous economic costs. There have been a number of articles that address the costs of pandemics, both in terms of the costs of past pandemics such as the HIV/AIDS crisis or estimates of the cost of future pandemics. Articles on these costs often regard ex post the costs of pandemics and epidemics. For instance, Haacker (2004) discusses the economic costs of the HIV/AIDS pandemic, while Santaaulalia-Llopis (2008) focuses on the impact of the HIV/AIDS pandemic on development. Yach, Stuckler, and Brownell (2006) discusses the costs of global growth of obesity and diabetes.

Other papers, many much more closely related to the COVID-19 crisis, have warned us to anticipate the economic costs of possible future pandemics and epidemics. Particularly prescient is Bloom, Cadarette, and Sevilla (2018). They closely delineate the economic concerns that are now in the forefront with COVID-19: costs to the health system, both public and private, of medical treatment of the infected and of outbreak control; the strain to health systems of being unable to concomitantly deal with more routine health issues during outbreaks; loss to employment productivity; social distancing disrupting economic activity; impact of tourism; impact on foreign direct investment. This concern is echoed by Fan, Jamison, and Summers (2018). They note very recently "an unmet need for greater investment in preparedness against major epidemics and pandemics." They estimate the expected annual losses from pandemic risk to be annually approximately 500 billion US dollars, or 0.6% of global income. In light of the costs of COVID-19, this seemingly large sum now seems greatly underestimated.¹ Other works that highlight the need for economic risk management vis-a-vis the potential likelihood of future pandemics include Bloom and Canning (2004); Lewis (2001); Madhav *et al.* (2017); Tam, Khan, and Legido-Quigley (2016); Yach, Stuckler, and Brownell (2006) and many others. We should also note articles that observe the number of "close calls," in which contagious disease outbreaks have occurred that were contained to a level far less than their potentiality. Particularly interesting

is Thomas (2018), who describes the recent lethal outbreak of the highly contagious respiratory disease Nipah in the Kerala area of India. In this case, a larger global health issue was averted by a remarkably fast response from public health workers.² Particularly striking is a report from Global Preparedness

Monitoring Board of the World Health Organization Global-Preparedness-Monitoring-Board (2019) as recent as September 2019, that asserts directly that the world is in imminent danger of a global pandemic and yet little or no preparation is being undertaken. According to Global-Preparedness-Monitoring-Board (2019), during 2011–2018, the World Health Organization tracked 1,483 epidemic events in 172 countries.

Impact of COVID-19 on banking and insurance:

Banks of course by their nature are vulnerable in times of economic downturns, because of the likelihood of nonperforming loans and the possibility in extreme cases of bank runs. To this point, Leoni (2013) find the spread of HIV in developing countries is associated with large increases in deposit turnover. They attribute this to the need to pay for individual treatments forcing large-scale withdrawals of deposits. Lagoarde-Segot and Leoni (2013) develop a theoretical model that shows that the likelihood of a collapse of the banking industry of a developing country increases, as the joint prevalence of large pandemics increases. Much of the group lending of microfinance institutions and banks' lending to the poor will be pressured during epidemics because all members of the group will be pressured by the aggregate shock (Skoufias, 2003). Rural financial institutions will be subject to bank runs during floods or crop failures (Binswanger and Rosenzweig, 1986). It remains to be seen how COVID-19 will change the practices of financial institutions. More generally, how long will banks, all around the world, maintain a more conservative lending policy post COVID-19? Have there been studies on bank reactions to macroeconomic shocks (Bongini et al., 2019) that are of the magnitude of COVID-19? Literature has considered whether "black swans" have a global impact (Wang et al., 2019). But COVID-19 is a globally impacting phenomenon. There is also the question of whether events of the magnitude of COVID-19 are insurable. Another question is whether COVID-19 should be regarded as a black swan, or an unforeseeable event with extreme consequences? The answer seems to be "no." When you have a host of academic articles, discussed above, suggesting the possibility of pandemics and predicting enormous economic losses as a result of pandemics; as well as numerous real-world epidemics and health crises that could have become global pandemics, it should be regarded as something other than totally unexpected. Clearly pandemics such as COVID-19 are foreseeable; and so it is highly beneficial such events are insurable. Tamura and Sawada (2009) discuss the possibility of such insurance in the context of avian flu epidemics in Vietnam. Of course, such insurance, at least at the private level, is generally only available to those that are financially included. The bottom of the pyramid will be likely left out. Sawada and Shimizutani (2008) note that in the aftermath of severe crises, those with personal collateral readily recover financially, while those without means of collateral do not.

Impact of COVID-19 on governments and publics:

Will COVID-19 lead to a long-term change in spending behaviors around the world? Haacker (2004), for instance, notes a permanent change in consumer behavior stemming from the HIV/AIDS epidemic. Obviously, a world-wide downturn in spending and domestic demands will present an enormous challenge for the global economy. Is there then a role for governments to insure against the financial impacts of pandemics? A strong role for the public sector is indicated in cases where the private sector is unwilling to insure (see how many pandemic exclusion clauses are in the fine print of insurance contracts). There may be less concern for the public sector crowding out private insurance (see Cummins, 2006). But is the problem too big?³ Cavallo et al. (2013) find that only extremely large disasters have a negative effect on output in both the short and the long runs. However, they note that their results stem from a few cases where radical political revolutions followed the disasters. How much of COVID-19's lasting effects on economic output will be driven by a catalyzing of political change? Is COVID-19 different enough from other natural disasters to be a special case? Or should we expect as in other cases of disasters, economic output will return to normal? Certainly, there is the potential for COVID-19 to impact the institutional nature of healthcare and public support; impact attitudes toward governments; and impact demands for effective public action. How will states manage the potentiality of natural disasters (Ghesquiere and Mahul, 2010)? It is likely that increasingly control and preparations for pandemics will be seen as a public good (Kolle, 2015; Yamey, Ogbuaji, and McDade, 2018).

Another question is how will COVID-19 impact social trust? The fact that pandemics such as COVID-19 affect differently differing portions of the economic spectrum and different ages will have ramifications. Noy (2009) observes that developing countries suffer more from natural disasters. As noted by Bjornskov (2008), social fractionalization undermines social trust. Less social trust leads to additional transaction costs throughout the

financial system (Fukuyama, 1995). What will be the impacts on popular support for social and economic globalization?

Impact of pandemics on financial markets:

While there is limited prior literature on how epidemics, let alone pandemics, impact financial markets, imperfect parallels can be drawn from other forms of natural disasters. Markets react to natural disaster such as earthquakes and volcanos; as well as air disasters; and more recently acts of terrorism. While, for instance, the COVID-19 has been devastating to airline industry around the world, with respect to air crash disasters, Bosch, Eckard, and Singal (1998) suggest some airlines, post air crashes, will benefit from customers shifting airlines. This is unlikely to occur with COVID-19 which is depressing air travel globally amongst all airlines. Certainly, COVID-19 will impact some industries more than others. But COVID-19 also will also enormously affect domestic demands generally across almost every country. The degree of overlap of other disasters providing insight into the potential impact of COVID-19 on the financial markets has much to do with levels of spillover associated with other previous events. As COVID-19's impact will blanket the globe, it is useful to compare the COVID-19 situation to past events that, although more localized, have led to spillovers that have established general impacts. Research on the impact of terrorist events on the financial markets might provide some sort of parallel, as terrorist events, while localized in their initial manifestation are by their nature designed to create a widespread change in public mood. Karolyi (2006) discusses the "spillover effects" of terrorist attacks and whether research on this topic suggests a broad-based or "systematic" contribution of potential terrorism to overall risk. His conclusion is that the evidence is quite limited, but there have been few tests that have examined volatility or beta risks with asset-pricing models. Some papers suggest that the downturn in markets with respect to terrorist events is rather mild, with downturns only very short (Brounen and Derwall, 2010). Choudhry (2005) investigated, post September 11, a small number of US firms in a variety of different industries to see if this terrorist event affected a shift in market betas, with mixed findings. Hon, Strauss, and Yong (2004) find that the September 11 terrorist attacks led to an increase in correlations amongst global markets, with this effect varying by global region. A number of other papers present a mixed picture of how much terrorist acts have spilled over into changes in the nature of financial markets (e.g., Chesney, Reshetar, and Karaman, 2011; Choudhry, 2005; Corbet, Gurdgiev, and Meegan, 2018; Nikkinen and Vahamaa, 2010). COVID-19 is perhaps a unique outcome in terms of its global scope as a pandemic, at least since the influenza pandemic of 1918. But, as discussed above, a disaster on the scale of COVID-19 was not an extremely unlikely possibility. It is interesting to compare the COVID-19 outcome (thus far) to an imagined nuclear conflict. Nuclear conflict, unless one considers dubiously a very localized impact, is not survivable by anyone on Earth. Consequently, a threat of nuclear war, apart from signaling economically impacting international tensions, is widely seen as having almost no impact on market prices. The reason seems to be not because of its low probability, but because in the event of a non-survivable event other outcomes are irrelevant. According to Epstein (2019) (following US Social Security Administration data), the probability of a 35 year-old man in the US dying within the next year is under 0.2%. For a 35-year-old woman, chances are about 0.1%. These probabilities increase only very gradually with age. Even a 50-year old man runs a mere 0.5% risk, a 50-year old woman just 0.3%. In comparison, what are the odds that there might be a global nuclear conflagration in the next year? The answer might be that we don't have enough data to form such an estimation. Nuclear wars, seen as probability tail events, are seen as not survivable by most people. In other words, the answer to a question of "how will nuclear war affect my 401k?", is that it doesn't matter because, absent life on earth, a defined contribution plan has no utility. COVID-19 on the other hand is creating economic destruction on an unprecedented scale (witness the \$2.2 trillion bailout package in the US versus the \$750 billion package during the global financial crisis). But, unlike global nuclear conflict, COVID-19 is survivable and the value of financial markets will remain extremely relevant. It seems very likely that the next time there is a sudden appearance of a contagious respiratory illness, there will concomitantly be a substantial global financial market reaction.

Certainly COVID-19 will shape future investigations of tail risk and financial markets (e.g., Kwon, 2019).

Impact of COVID-19 on financing and costs of capital:

An issue that will likely be considered by researchers is how COVID-19 will potentially permanently change firm financing. As discussed above, COVID-19 highlights the possibility, or indeed the likelihood, of contagious disease events that will have tremendous negative impacts on global domestic demand. This is a game changer from financial markets neglecting to price the potentiality of horrific tail-risk events that would not be survivable anyway. COVID-19 and others like it are globally damaging to the world economy to a rarely precedented extent. But they are survivable. We should expect now that there will be a long-term impact on firm financing and firm costs of

capital. Elnahas, Kim, and Kim (2018) find that firms located in more disaster-prone areas adapt to be less levered. Consistent with a trade-off view of capital structure (Kraus and Litzenberger, 1973), they attribute this finding to firms being impacted in disastrous areas with respect to operating disruption, increased costs of capital, and tightened financial flexibility. While firms are often seen as persistent in their capital structure policy, they often respond to macroeconomic shocks (Huang, Gao, and Chen, 2018). COVID-19 clearly suggests a previous underpricing of equity risk. Will this lead to firms adopting less leverage? Will there be a very long-term shifting in costs of equity? Lee and McKibbin (2004) find a 200-basis point increase in the country risk premium for China and Hong Kong following SARS. While the impact of country-risk premiums on costs of equity will vary with firm exposures to various markets, certainly, an increase of two percent points in a country risk premium (likely much higher for COVID-19) would lead to a significant increase in the cost of equity capital, with a concomitant underfunding of global pensions. But the findings of increased country risk of Lee and McKibbin (2004) for China and Hong Kong are based on China and Hong Kong being particular risk areas for SARS. With a genuine pandemic like COVID-19 however the exposure is global rather than in select countries.

Conclusion:-

As I am writing this paper in early May 2020, when the death toll of the pandemic continues to rise, and there is no clear exit strategy, any economic analysis is fraught with uncertainty. The data on financial markets we have assembled along with some forward-looking reflections, however, suggests clearly that actual and potential impacts of the pandemic on financial markets, sector and centres are highly uneven. To start with, the review of financial market developments highlights the significance of the state-finance nexus, and particularly the international monetary hierarchy. The Fed and the US\$ have led the show, highlighting the lopsidedness of the global financial system. Developing and some emerging economies have been challenged most, through the pressure on their currencies and financial markets, even before the pandemic itself hit them with full force. Eurozone member states have again faced the self-imposed constraints of the currency block without a common fiscal policy (Buiters 2020). Moving from the financial markets to sector, we discussed why banking, particularly its retail variety, due to new technologies, changes in customer behaviour, and the specter of non-performing loans, is likely to be challenged more than insurance or other financial and business services. We have reflected on potential impacts on financial centres, leading us to expect more challenging times for local and regional financial centres. How do the actual and potential impacts of the pandemic compare to major trends in finance we had seen between 2008 and 2019? To start with, we may expect a slowdown or even a reversal of the wave of financial regulation triggered by the GFC, as the financial sector experiencing difficulties (not of their own making this time) is allowed more 'breathing space' (BIS 2020). We can, however, expect most governments to promote an accelerated transition to a cashless economy, and some of them to challenge tax havens. Second, difficulties faced by smaller firms, and economies of scale resulting from new technologies, could lead to more firm-level consolidation across FABS, accompanied by continued unbundling of FABS value chains. Third, FinTech, after enjoying a decade long investment boom, is facing a challenge. On the one hand, demand for new digital financial technologies is increasing, but on the other many FinTech start-ups could struggle to survive the recession and access capital, thus offering an advantage to incumbent banks, and particularly big technology firms with deep pockets. Fourth, while businesses will be desperate to reduce costs, they will have to turn to lawyers and consultants to help them navigate through the crisis and beyond. As the crisis is shaking their finances, the preparation and verification of their financial situation by accountants and auditors will only become more important. As a result, we would expect the trend of growing business services to continue beyond the pandemic, while employment in financial services, particularly banking, continues to stagnate or decline. Going back to the macro-level, between 2008 and 2019, we had seen a gradual, but slow growth in the role of China and other leading emerging economies in international financial governance. Consider G20, Asian Infrastructure Investment Bank or enhanced voting power in the IMF and the World Bank. Like the GFC did before, however, the pandemic thus far has exposed the weakness of international financial institutions and the primacy of national ones (Helleiner 2014). As the pandemic has spread in the US much more widely than in China, resulting in longer and more widespread lockdowns, it may accelerate the growth of the Chinese in relation to the US economy. Any challenge of the Chinese currency to the US\$, however, seems to remain a remote prospect. The GFC has stimulated research in financial geography, and so should the pandemic. As this commentary shows, even though the current crisis did not originate in the realm of finance, it has profound financial ramifications, and in fact finance can be seen as one the links that connect the two crises. In many countries, including the UK, the GFC was followed with austerity policies. Public health has been one of its victims, with underfunded NHS and life expectancy in the UK falling between 2014 and 2019 (McKie 2019). Social cohesion has been another victim, as austerity policies helped the politics of ultra-right populism gain ground. While after 2008, the cascade of crises, building on Walby's (2015) concept, started with finance, and moved via economy to society, including public health, this time the order

is reversed, starting with public health. The crisis has undoubtedly highlighted the role of the state and public finance in the economy. The eminent threat is that once the pandemic is over, governments will again resort to a new dose of austerity, instead of using the crisis as an opportunity to embark on investment in infrastructure that helps to address the threat of future pandemics but also the ongoing climate and biodiversity crisis (Hallegatte & Hammer 2020). To explore such opportunities, we would advocate more collaboration between economic and financial geographers on one hand and heterodox economists on the other. Heterodox economics can offer us a better understanding of macroeconomic policies and public finance. Economic and financial geographers can offer insights into the multi-scalar nature of financial markets, and their spatial diversity, including the significance of financial centres, as well as connect heterodox economics with environmental sciences. Together we may be able to envision some alternative futures as we are moving towards a post- COVID-19 world.

Recommendation:-

The model provides a preliminary explanation and prediction of infectious disease behavior and adds new theoretical information about the nature of epidemics since always there is a gap between a real influence on the nature of an epidemic and a theoretical understanding of that influence. Furthermore, the paper introduces the concept of stagpression, a new economic phenomenon to explain the uncharted territory for the world economies and financial markets are getting into. It is plausible to expect that the aftermath of Covid-19 has the potential to cause widespread economic disruption. Φ -Simulator findings suggest that the 150 lockdown period can be disastrous for all economies if they cross their sustainability threshold level. The analysis of ten major stock markets worldwide shows that the effects of Covid-19 can generate similar damage to the Crisis 1929 ($\bar{G} = 0.23$). It will require a 9-to-12-month recovery phase considering the outcome of American elections, the reconstruction measures of the European economies and the decentralization of production from China. ϕ -Simulator offers to policymakers, central banks, academics and students in economics an alternative multi-dimensional graphical modeling approach to analyze the final impact of any massive pandemic contagious diseases impact on many stock markets simultaneously from a multi-dimensional perspective. We can observe with the ϕ -Simulator possible scenarios and the final impact of any massive pandemic contagious diseases by the levels of the global average stock market performance index (\bar{G}).

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