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On the Growth and Relative Interconnectedness of Financial Markets and the Bubble Effect

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Abstract

The paper considers how the interconnectedness of global financial markets has led their growth over time in line with the evolution of these institutions across the globe. This development leads inevitably to the ‘bubble effect’ in the global financial architecture as it continuously evolves in accordance with the learning process that is going in these markets. Descriptive and analytical methods were employed in carrying out the examination of the parameters involved.

The global economy is interdependent and influenced by so many forces. There is no denying the fact that as an economy develops, so does its financial or capital market relative to developments elsewhere in the world especially the advanced economies as the reference points where the financial systems are highly sophisticated and well-developed. The more a nation’s economic system develops, so also would the level of financial intermediation increased and associated institutions would become more sophisticated and complex. In exploring the growth of economic interdependence of various nations of the world, Cooper (1977) noted that actions in one country are transmitted ever more quickly and sometimes irritatingly to other countries. Economic relationships are no longer confined to the traditional exchange of manufactures for food and raw materials, though much of that remained. He observed economic transactions have increasingly become exchanges of manufactures for manufactures, financial capital movements between countries, and transfers of technology, and direct foreign investment with ownership of an establishment lying outside the country in which it is located. These developments reflect a growing mobility in factors of production, and this greater mobility in turn implies less natural insulation between national economies. This study examined the growth and interconnectedness of financial markets globally with a view on elucidating some of possible developments in this area or domain which are either apparent now or in the nearest future. This is the gap that this study intends or attempts to address. The study is distinct in some regards as there are few or no studies that have specifically examined the issues considered in this paper. The paper is divided in five sections. Following this introduction is Section II which presents a review of the Goldsmith hypothesis of financial development while Section III explores a detailed exposition of the growth and interconnectedness of financial markets. Section IV provides an appraisal of the theoretical formulation of the preceding section while Section V concludes the study.

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II. Goldsmith Hypothesis of Financial Development: Review

An interesting evidence or observation in economic literature on this proposition or formulation is what can be termed the Goldsmith hypothesis of financial development. Kindleberger (1987) extensively explored the contribution of Goldsmith (1969) who demonstrated that the ratio of financial liabilities to national income in a country rises as the economy grows starting in developing countries at some ratio as 0.25 and leveling off in advanced industrial economies somewhere in the vicinity of 1.5 or 1.76. This postulate or hypothesis suggests a linear relationship between financial intermediation and the economic growth of a country, though in a somewhat unequal proportion within the context of a spatially distributed global landscape. Moreover, Kindleberger observed that financial deepening comes from an increasing number and size of financial intermediaries that assist savers to find the types of outlets that they want in terms of liquidity and risk, and borrowers to acquire liabilities with which they are comfortable. These developments he noted are sequent to the introduction of new financial instruments as rightly predicted by Lamfalussy (1985). Kindleberger had noted particularly that at a meeting of the American Economic Association in Dallas in December 1985, Alexandre Lamfalussy, then Economic Advisor and later Managing Director of the Bank for International Settlements observed that the world monetary system was experiencing four revolutions at once – a regime of flexible exchange rates not regarded as temporary, new and cheaper transport and communications knitting world financial markets tightly together, a variety of new financial instruments of an innovative sort and spreading financial deregulation. The third revolution, i.e. the development of new financial instruments is of particular interest to us here. These instruments according to Kindleberger include the development of Euro-currencies and Euro-bonds, Special Drawing Rights (S.D.R.), the European Currency Union (E.C.U.) now the euro, unit of account bonds, currency swaps, interest swaps, repos, money market funds, junk bonds and the expansion of the American Depository Receipts (A.D.R.s). All these considerations apparently supports or confirms our position that as an economy grows or develops, so also its financial sector grows at a relatively higher rate or proportion between 1 and 2. This perhaps corresponds to the 1.5-1.76 levelling off of financial intermediation in the Goldsmith hypothesis.

III. An Exposition on the Growth and Interconnectedness of Financial Markets

The degree or scale of this observed phenomenon is however not constant. When an economy develops let say at the rate of \( n \), the financial institution in such country developed at a much faster rate but less than a double or two-fold increase eurhythmically at the national level relatively to development of the global financial system. In other words, if an economy at time \( t \) increased or developed relatively to the global financial system at a proportionately higher rate, \( n + A \), where \( A < n \) in quantitative terms. An example would suffice at this point. Suppose there is a hypothetical economy known as Tayanba with a financial market that is highly connected to the global financial establishment through capital assets and liabilities as well as through trade and economic transactions. Now if between a two time horizons \((t_1, t_2)\), the Tayanban economy grows and develops at the rate \( n \), its financial market would grow relatively to the global financial system at a more proportionately higher rate of \( n + A \) where \( A \) is a fraction of \( n \). A mere pro rata increase would have implied constant returns to scale. More explicitly, when the economy grows at the rate of \( n\% \), its financial system grows and develops at a proportionately higher rate of \( (n+1/n) \% \). The raisond’etre behind this phenomenon cannot be certainly ascertained, but apparently it might
possibly be due to the volatility and uncertainty behaviour of an economy’s financial institutions. Capital in the global economy moves with ease in a sophisticated manner due to the highly interconnected financial systems not only at regional levels but also at the global level. The spatial distribution model of the global financial system is such that if there are let say, 5 regions (a, b, c, d, e) interconnected by trade and investment, any development or event in the regional market a, for instance would produce a seismic or chain reaction in the remaining four markets which would be affected more or less by their level of insulation (depending on the economic model they run) among other factors. The regional markets are more likely to be well-developed than each other based on development and historical factors not unconnected with trade and capital flows over time. The spatial dimension of these markets does not in any way obstruct this interdependence and interconnectedness but rather reinforces it. If there is a serious financial crisis resulting from the volatility of financial assets and capital flows in period l originating from let say market b, there is the cyclical possibility of such a development or occurrence in the period, \(l + \varepsilon\), where \(\varepsilon\) is a time horizon between one and five years. The likely periods for such occurrence in other markets vary and hence \(l_1 + \varepsilon, l_2 + \varepsilon\) etc. A graphical illustration is depicted in fig. 1. The cyclical nature of the crises periods in the market described the bubble periods when the volatility of these markets become more pronounced or revealed and are likely not unconnected to the aggregate demand patterns, consumption, fiscal and monetary policies etc. in the economies that make up those regional markets. Meanwhile, as earlier noted, when an economy grows and develops at the rate of \(n\), its financial institution grows at the rate of \(n + 1/n\). Some facts are however, worth noting.

It is imperative to note that the growth of the domestic financial system at the rate, \(n + 1/n\) is very significant. The incremental factor, \(1/n\) is the point in view here. It refers to all the possible explanation for volatility as well as the uncertainty surrounding financial markets and nature of real life economic activities over time. The stochastic nature of economic variables and financial intermediation gave rise to the incremental factor, \(1/n\). We assumed Cobb-Douglas production technology in this paper as part of our methodological framework. Hence, the degree of homogeneity of the domestic financial system’s production function is somewhere between 1 and 2. One pertinent point worth noting is that the growth rate of \(n + 1/n\) postulated here is with regard to all the financial systems in the domestic economies of all the regional markets (a-e) which are interconnected through high level digital technology and real time online transactions. The regional markets are also connected by a string or web of complex system of short and long term financial instruments and devices such as derivatives, sovereign bonds, repos etc. Whenever there is a bubble crisis, the capital flows result in a fluid and complex manner.
In Fig.1, the relationship existing between the growth of the financial markets and the bubble effect is illustrated more clearly. The volatility of the financial market is so huge that it apparently resulting in a bubble trap where a crisis period in any regional market at any point in time would produce a ripple or resonance of such an event in the globalized financial system. The effect is also spiral in nature which produces an atmosphere where economic agents as rational, optimizing participants form a psychological viewpoint on such occurrence or event and this result in the
rallying round of market forces thereafter. It also creates an array of expectations and uncertainty by these agents in the event of a similar occurrence in another regional market at another different point in time. It has been suggested however that the most difficult problem that economists and policymakers faced is to understand how the existence of uncertainty affects people’s behaviour and in particular their reaction to various economic phenomena and policies (McKenzie, 1974: 63). McKenzie further noted that the informational requirements for the achievement of equilibrium are quite large. When we realized that people base their decisions not only on current prices and incomes but also on expectations about the future values of these variables, the magnitude of the problem becomes apparent. It is expedient to stress that the informational set or array available to the agents in these financial markets is certainly asymmetrical as anything short of that would not only negate economic principles and assumptions but also lead to inefficient allocation of resources over time. The characteristic behaviour of increased financial activity or transactions particularly resulting in the incremental factor $1/n$ is remarkable. This increase is sometimes enormous and profound that it takes an exponential form or nature. It is more often than not due to the volatile nature of financial assets and instruments which are somewhat risky and uncertain. Moreover, the forming of psychological viewpoint by the optimizing agents may possibly lead them to engage in speculative trading and transactions in the next period which creates the very possibility of a re-occurrence in a cyclical manner. The processes, expectations and transactions in these regional markets as well as the domestic financial markets are not linear in nature. Their nonlinearity further increased the volatility of events and activities in these markets.

The relativity of these markets is now considered. Since these markets are interconnected, their interdependence and the functionality of such depend on the relativeness or relativity of one market to the other. Because the distance apart let say between any two of them may be immense but which is rendered insignificant due to high level digital technology, the transactions in one market at any particular point in time is a function of the volume and level of transaction in the other within the context of a globalized financial model. This is made possible by international trade, the exchange rate mechanism and investment portfolio flows. The level of this relativity and interconnectedness is facilitated more or less by medium and long term capital movements than by short term capital. The reason is not far-fetched as investors have their eyes or expectations on portfolios that are more volatile and riskier in the rapidly changing global landscape than those capitals such as treasury bills and other short term instruments that are less risky and volatile. One important means or avenue that facilitates and sustains the relativity as well as interconnectedness of these regional financial markets is sophisticated digital technology. Imagine a scenario where two regional markets A and B exist in a global setting.
The financial landscape is such that A and B lie on different contours in the model framework in Fig.2. Now the growth and development of A happened relative to that of B in a sort of linear fashion. If B, being a larger market for instance shrink or contract in activity and transactions, this also affect A as activity and transactions there either falls drastically or altogether shrinks.

As events and developments unfold in let say A, it revealed the preferences and expectations of economic agents there which might be mirrored or replicated in market B either instantaneously (as a result of high level digital technology) or in the next trading period. The transactions, activity and level of technology in one is mapped in to that of the other over time. This is because of the Law of One Price. The learning process in any of these markets is approximately equal to the square root of the difference in distance between it and another divided by the difference in their distances apart. If for example, the distance between markets A and B is $d_2-d_1$, then the learning process is approximately, $\sqrt{d_2-d_1} / (d_2-d_1)$. The nearer or approximate the value is to 1, the quicker is the learning process in such a market. The further the value is away from 1, the slower is the learning process in such market. The more insignificant the value of this learning variable, the more the intensity of the volatility in such financial markets as well as uncertainty in the event of a bubble crisis. The learning process and pattern is intricately linked to human capital and as such having a comparative advantage in high learning goods which noted Lucas (1988) lead to higher-than average real growth only if the goods in the human capital model are good substitutes.
Moreover, there is obviously a direct correlation between productivity growth and the learning process in these markets.

If the epicenter of any bubble crisis in let say period $t$ is $A$, the likely probability of such incidence occurring again there would be $1-\mu$, where $\mu$ is the value of the learning process just considered above. The time period for such re-occurrence in $A$ would be $2t+1$, ceteris paribus. In the event of any seismic bubble crisis in $A$, a resonance is produced in the rational, optimizing economic agents in market $B$ and the effect of such developments last in them till subsequent time periods. The converse is also true if the bubble originates from $B$ in lieu of $A$. The relativity and interconnectedness of these markets is important here in the context of the time-effect space.

The production function of any of these financial markets is a function of some variables that determines its transactions, activity etc. Thus:

$$Q = F(e, \mu, v_o, T, B, L, K)$$

[1]

where $Q$ is the total productivity of the market let say $A$, $e$ is an exponential factor or variable that profoundly influenced the incremental factor, $1/n$ earlier considered; $\mu$ is the learning behaviour variable of the particular market; $v_o$ is the financial volatility originating from other markets; $T$ is the level of the market’s digital technology access; $B$ represents the bubble effect while $L$ and $K$ are the conventional labour and capital input variables. It is however pertinent to note that the labour input here implied not only the workers employed in such a market but all the human economic agents connected directly or indirectly to this market while the capital outlay ($K$) is the sum total of the financial assets less liabilities that are the subject of transactions in such markets. Factors of production, capital or labour or both will flow to the highest returns which means where each is relatively scarce according to Lucas (1988). Capital-labour ratios will move rapidly to equality and with them factor prices. However, he noted that in a multiproduct model, factor price equalization can be achieved without mobility in either factor of production. As earlier noted, we assumed a Cobb-Douglas production technology, hence expressing [1] in the context of this framework we now have:

$$Q = AL^\alpha K^\beta e^\delta \mu V_o TB$$

[2]

Log-linearizing [2] results in to:

$$\log Q = \log A + \alpha \log L + \beta \log K + \delta \log e + \log \mu + \log V_o + \log T + \log B$$

[3]

We would recall from our earlier postulation that the framework is based on the central assumption that the degree of homogeneity of the production function is between 1 and 2, therefore $\alpha + \beta + \delta > 1$. More explicitly however, $1 < \alpha + \beta + \delta < 2$ with $\delta$ determines a primal influence on the incremental factor, $1/n$. In the event of proxies been found for the variables in the model framework outlined in equations 1-3, and then it can be subjected to econometric estimation. Now let us assume that $\alpha + \beta + \delta = \Phi$ from [2] and that the growth rate of $Q$, that is, the percentage increase in $Q$ in the event of a $n\%$ growth of the economy is $(n + 1/n)\%$. The labour and capital inputs would account for $n\%$ growth in the market while the exponential factor, $e$, accounts for the remaining fractional $1/n$ component of the growth rate of the market. The total productivity elasticity of the financial market $A$ for instance, $\Phi_A$ would amount or sum up to this growth rate in any circumstance. The elasticity of total productivity with respect to the variables labour, capital and the exponential factor in market $A$, $\Phi_A$ would not necessarily be equal to that in the other markets: $\Phi_A \neq \ldots \Phi_E$. The function,
Q(·) has an increasing returns to scale but which is less than a double fold magnitude. $Q'(·) > 0$, $Q''(·) < 0$. It is imperative to note that $L$, $K$ and $e$ represent or implied the primary variables since they account for the growth rate of the market while $μ$, $V_0$, $T$ and $B$ represent the secondary variables because they only attempt to explain other influences and phenomena not associated or unconnected with the market growth.

It is assumed that the markets are linked by a complex web of financial instruments and devices closely associated with capital flows and investment portfolios such as derivatives and sovereign bonds. Default on any of these financial devices or vehicles can orchestrate a bubble crisis in any market at a particular point in time. The precision associated with digital technology necessitate that these devices would have been allocated for payment and resettlement of debt and financial obligations over time. This certainly dictates the direction of flow of these highly fluid capital instruments. Therefore in the event of any default by the economic agents, who are rational optimizing participants in these markets, volatility and capital flows are inevitable and the consequences of such developments precipitate bubble crises which are a sort of self-fulfilling prophecies. An explanation of how default on derivatives and other financial devices cause bubble crises would be attempted here.

Now, if $D$ is the value of a derivative device in period 1 in a 2 period financial economy and $D^*$ is its worth at the end of the trading or transaction process in period 2, their difference portends some important or critical implications in this analysis. Therefore, if $D^* - D = Ω$, where $Ω$ represents the degree or level of default by agents in the market and its value lies between 0 and 1, i.e., $0 < Ω < 1$. It is apparently clear that $Ω$ determines whether economic agents would be able to meet their payment and resettlement obligations and hence ensure a smooth functioning of the market. The recent instance of a possible U.S. government default on its debt obligations, the so-called “debt cliff” or debt ceiling in recent times is an evidence of the uncertainty and risks associated with bonds of all kinds- government bonds, Euro bonds, corporate bonds etc. Moreover, the reaction and behaviour of these derivatives most probably follow a random walk.

The value and propensity of $Ω$ underlies the possibility of whether there would be a volatility of the financial assets or otherwise. The magnitude of such a value or propensity leads also to the very possibility or otherwise of a bubble effect. A low value is indicative of a healthy, smooth period devoid of bubble crisis while a high value portends or revealed the much possibility of a bubble crisis.

One remarkable dimension about financial derivatives in recent times is their link to monetary policy measures in advanced economies such as quantitative easing (QE). Interest rate smoothing by the central monetary authorities in these economies result easily in the flow of capital and other financial assets in a highly fluid manner in out of them from developing and emerging economies. It seems perhaps that derivatives now represent the major financial instrument or vehicle ensuring interconnectivity among financial markets (both national and regional) across the globe. Financial markets that deal with derivatives are also known as forward markets, though they are primarily engaged in buying and selling foreign exchange for future delivery. Such contracts are usually for 30, 60 or 90 days although they may be for some duration, possibly longer. The existence of forward markets facilitates four important types of transactions, i.e., covering, hedging, arbitrage and lastly speculation (McKenzie, 1974: 64). They are designed or developed to ‘hedge’ against risks. Hedging risks has been noted to be crucial to optimal portfolio choices (Romer, 2001: 350). Exposure of financial assets to risks in the international capital market increase the risk aversion
of agents to portfolio choice and management and hence increases the demand for derivatives and invariably lower their returns in the long run.

The advent of the Internet in the 1990s has greatly influenced how this interconnectedness had evolved. Earlier studies observed that technological advancement in the areas of satellite and cable technologies as well as the Internet have brought profound and irreversible changes in the lives of people all over the world. Vast economic transactions among financial markets are conducted through the Internet. Financial traders and other economic agents move their capital with ease from one capital market to another because these global financial markets are linked by instantaneous global communication. A currency dealer or speculator for instance can easily move his capital from the Wall Street (New York Stock Exchange) to the Japanese Stock Exchange if he feels he would make more profit there within a couple of minutes through the Internet. This is the online global financial market. Stock exchanges such as the New York Stock Exchange (NYSE), the world’s largest exchange, the London Stock Exchange (FTSE100), the Japanese Stock Exchange (Nikkei Index) etc conduct their financial transactions online at real time. There is no doubt that this vast, huge global financial architecture facilitated by the Internet immensely influenced macroeconomic activities and policies in many economies across the world. It ensures the interconnectedness of these financial markets and also their growth over time.

IV. Conclusion

The paper considered the idea of the relative interconnectedness of markets as well as their growth hypothetically. This is in the light of happenings in the financial markets and economies round the world. It also considered the conception of a “bubble effect” inherent in these markets. The reality of today’s global markets indeed points to the issues considered in the study. However, how the model explored explained reality in these markets is indeed an avenue for further research.

Reference

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