Financial Deregulation and Asset Price Volatility under Perfect and Imperfect Information

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Abstract: This paper is intended to focus on the issue of volatility of the capital market in an emerging market economy. The present paper theoretically inquires whether financial globalization and other deregulating measures have any impact on the volatility of the capital market. It accentuates the role of information in this regard to reconcile theoretically the diametrically opposite findings of different studies made in this area. To this end a model based on rational expectation is framed. Expectational difference equation is used as a tool to solve the model. It is found that if information passes freely and perfectly, the volatility of the capital market will remain unaffected, whereas, the imperfectness in information leads to the increase in volatility. So, contrary to the conventional wisdom, the paper concludes that the volatility is independent of the course and the process of deregulation, rather the quality information plays the key role in the determination of volatility.

Key-words: Asset price volatility, rational expectation, globalization, perfect and imperfect information.

1. Introduction

During the last two decades many economies have been progressively deregulating their domestic economic and financial structure and these economies have also made their financial sector open to enable free movement of capital. These deregulating measures have caused precipitous increase in the inflow of external fund in these emerging market economies. Inflow of global fund has fuelled the process of economic growth. The productivity of both capital and labor has increased significantly. As a result, the prices of the domestic assets have increased and so has the possibility of capital gain. It has made the domestic assets very much attractive to the international speculative investors. Private investment has also increased with the financial deregulation. *Henry (2000a)* shows how the equity prices have increased. *Henry (2000b)* analyzes a group of 11 countries and shows empirically that stock market liberalization has a positive impact on the private investment.

But there are some matters of concern as well. With financial liberalization, all types of global portfolio fund are venturing around the world for speculative gain. It is widely believed that making the capital account open would expose the domestic asset market to the volatile portfolio fund and would increase the volatility of the domestic market. In this paper we would like to analyze theoretically how far this conventional wisdom is relevant. The primary quest of this paper is to judge how the financial globalization affects volatility in the asset market.

There has been a long standing debate on this issue. There are scholars who argue that economic liberalization often brings economic instability in emerging economies. *Erturk (2005)* outlined a '*non-imperfectionist*' account of why and how the capital account liberalization can systematically lead to economic volatility even in the absence of market imperfection. He has pointed out that opening of the capital account creates the scope for currency substitution and erratic capital movements across the border. These two factors are intertwined with each other and make the asset price more volatile. *Edwards, Biscarri and Gracia (2003)* after studying six emerging (four Latin Americans and two Asian) market economies (who have liberalized their financial account in early nineties) have found that cycles in these economies tend to have shorter duration and larger amplitude compared to developed countries. That is, the volatility has increased with the financial globalization. They found that after liberalization the Latin American markets behaved more like the developed markets of the advanced economies. However, after liberalization the Asian economies behaved more dissimilarly. So, the financial liberalization does not affect all the emerging economies in uniform manner.

There is a view that financial liberalization results in not only an increase in the volatility of the financial sector, but it also raises the volatility of the real sector. There are a number of authoritative articles in favor of this hypothesis. *Stiglitz (2000)* reviews the arguments in favor of capital market liberalization and identifies their theoretical and empirical weaknesses, and he advocates for intervention in this regard. *Agenor (2003)* provides a selective review of the contemporary analytical and empirical literature on the benefits and costs of international financial integration. The author discussed the impact of financial openness and capital flows on consumption, investment and growth. He also discussed the effect of entry of foreign banks on the domestic financial system. He argues that a small open developing economy may get benefits of financial integration in long run but there are significant risk factors in the short run. He argued that a careful and cautious approach is imperative to prevent any short term policy reversal.

There are articles advocating international financial integration by emphasizing 'risk sharing'. Sharing risk, as they argue, actually reduces variability in consumption growth. *Obstfeld (1994)* develops a continuous-time stochastic model in which international risk-sharing yields substantial welfare gains. He argued that global portfolio diversification results in a shift of capital from a low-yield (safe) to a high-yield ('inherently risky') sector. This provides a continuous array of specialized production inputs, which leads to a continuous increase in the level of welfare through its effect on expected consumption growth.

Bekaert et al. (2004, 2006) examined the effects of equity market liberalization and capital account openness on consumption growth volatility. They found that countries that have more open capital accounts experience a greater reduction in consumption growth volatility after equity market openings. They also found that financial liberalizations are associated with declines in the ratio of consumption growth volatility to GDP growth volatility. They found that the opening of financial sector for foreign portfolio investment does not raise economic volatility.

Buch et al. (2005) discussed whether the integration of international financial markets affects business cycle volatility. In the framework of a new open economy macro-model, they show that the link between financial openness and business cycle volatility depends on the nature of the underlying shock. They also empirically substantiated the theoretical model to show that the link between business cycle volatility and financial openness has not been stable over time.

However, *Santis and Selahattin (1997)* did not find support for the claim that market integration increases price volatility. *Bhattacharyya (2011)* found that the volatility of the asset market will remain unaffected even after financial globalization in the presence of perfect information. *Jayasuriya (2005)* found that volatility may decrease, increase, or remain unchanged following liberalization. That is according to him it is hard to draw any definite relationship between financial liberalization and asset price volatility.

After reviewing the literature we can hardly find unanimity in the findings of different researchers. Some scholars suggested that financial liberalization raises the volatility of the domestic economy. Some others found diametrically opposite results. It is quite understandable that such a striking difference in the findings is due to methodological differences and due to differences in the cases of study. There are economists, as we have seen, who have argued that it is not possible to derive a unique correspondence between financial globalization and economic volatility. It is the differences in opinion, which have motivated the present study. The present paper is purely a theoretical one and is intended to

find the impact of financial globalization on asset price volatility and would like to reconcile theoretically the diametrically opposite findings of different studies made in this regard.

In the existing literature the role of the quality of information during the process of financial deregulation is absent. We have prepared an asset price determination model for an emerging economy. During the process of globalization, the exact course of policy change may or may not be known to the agents, depending on the quality of information prevailing in the economic system of the country. The model calibrated in the present paper intends to encompass the issue of nature of information (perfect or imperfect) in the context of the asset price determination model. This paper intends to develop an analytical framework to show whether opening of capital account introduces any additional volatility into the domestic asset market under imperfect information. Later we would like to compare the case with that of the perfect information. To this end, we calibrate a rational expectation model to observe the effect of liberalization of capital account on the volatility of stock market[1]. As far as the 'tool' is concerned, Rational Expectation based 'Dividend Discount Model' is used and is solved through recursive method.

We see that under perfect information the volatility of the asset price remains unaffected with the policy change, whereas the results differ in case of imperfect information. So, it is not financial liberalization, rather it is the nature of information which is found to be the volatility determining factor. Consequently, it is not unnatural to get completely opposite results unless the nature of information is not considered in the study. This could be one of the plausible explanations of the contradictions in empirical findings of different scholars.

A liberalization measure cannot be once and for all. It is most unlikely that the domestic authority all of a sudden opens all channels of financial flow. Rather, it is a process where the government gradually withdraws the restrictions on the inflow and outflow of foreign capital. The information of the policy change may or may not pass to the agents perfectly. In a democratic system where the political system runs smoothly, it is expected that the decision of financial globalization, like many other socio-economic and political policies, will certainly invite controversy and hence instigate much desired debate among the law makers, social thinkers, economists and most importantly among the common people at all levels of the society. So, prior to the commencement of the program people may get 'adequate' information, if not all, regarding the course and duration of the program, even if the government does not explicitly declare the same. Hence, it would not be very unrealistic to assume that the agents anticipate the policy change and its path. Again, it is also likely that the information may not pass perfectly due to some exogenous shock and the government deviates from the pre-declared policy path, which could surprise the agents. So, both perfect

and imperfect information in the context of transmitting information is relevant and cannot be ignored. Similarly, the information regarding the performance of the corporate sector may or may not be transparent enough.

The rest of the paper is organized as follows. Section 2 of the paper will be devoted to framing the model with explicitly stating and analyzing the assumptions. In section 3, we would solve the model for imperfect and perfect information and compare the results of both the cases. In the concluding section, i.e. section 4 we would summarize our findings and results.

2. Structure of the Model

First, we are to determine the price of a risky asset of an emerging market economy, which is gradually deregulating its domestic financial structure, and estimate the volatility of the same under imperfect information. Thereby we would try to focus on the impact of financial deregulation on the volatility of the price of the asset. We would try to compare the case with that of perfect information and draw some important inferences on the issue. In this section we would present the basic structure of the model. The model has been kept as simple as possible to avoid computational difficulties without deviating from the primary focus. Let us first state the assumptions to plinth the model.

1. Let us consider an economic agent, who forms expectation rationally. That is, the agent collects all the necessary information from the existing *information pool* by taking dips to the content, and forms expectation rationally. In that sense, it is a Rational Expectation Model. As we all know, under Rational Expectation economic agents' subjective expectation will coincide with the true value of the objective mathematical conditional expectation i.e. $x_t^e = E(x_t|\Omega_{t-1})$ where Ω_{t-1} is the information set available at period t-1.

2. Let, d_t be the rate of return (dividend) resulting from each unit of the stock (the asset) at period t. Now let it fluctuate around a steady-state growth trend given as,

   $$d_t = a(1+\gamma)^t + u_t \qquad (1)$$

   where, u_t is the cyclical factor and it is supposed to follow a first order autoregressive process AR[1].

   $$u_t = \theta u_{t-1} + e_t^d \qquad (2)$$

   Here, e_t^d is a random element, which follows a white noise process i.e.

   $$E(e_t^d) = 0.$$

$Var(e_t^d) = \sigma_d^2$ (Constant) and

$Cov(e_{t-s}^d, e_t^d) = 0$ if $s \neq 0$.

Let, $|\theta| < 1$. By the virtue of this restriction, we are actually assuming the shock to be stationary i.e. it eventually dies down. Following the basic properties of AR[1] process and due to the assumption $|\theta| < 1$ we can say that, $Var(u_t) = \sigma_d^2 / 1 - \theta^2$ and $Corr(u_t, u_{t-s}) = \theta^s$. So, both the variance and autocorrelation are increasing in θ.

3. Let τ be the 'tax' imposed per unit of inflow and outflow of stock. This 'tax' represents all sorts of impediments and barriers that the agent faces. As stated already, the EME is gradually making its financial sector open. In our model, deregulating financial sector means gradual reduction of τ. The liberalization program is a process and it cannot be once and for all. Hence the gradualist approach thus seems quite reasonable. Let the time path for τ be:

$$\tau_t = \rho^t \tau_0 + e_t^\tau \qquad (3)$$

Here, ρ is a parameter and is assumed to lie between zero and unity. This ensures the gradual reduction of τ. Now, if the government strictly follows the liberalization program irrespective of any exogenous and endogenous shock, the random component e_t^τ can be dropped. But that would hardly be a realistic assumption. It would be fair to assume $E(e_t^\tau) = 0$.

4. Let us suppose that the process of liberalization starts and terminates at period *0* & *T* respectively.

5. Let us assume that the information transmitted to the agent is subject to "noise" disturbance. That is, the agent receives some exaggerated or précised value of d_t and τ_t, instead of the true values of the variable. If it is thought that information regarding the dividend path (i.e. the path for *d*) as disclosed by the corporate sector lacks accountability and if due to some exogenous disturbances the course of the government policy (i.e. the path for τ) fails to follow the well-defined pre-declared path, the agent receives information with some "noise". It is also possible that some irregularities on the part of the corporate come into light. This will definitely perturb the trustworthiness of the corporation. The agents might believe that they are receiving distorted information. This will surely affect the process of formation of expectation. Moreover, during socio-political turmoil, which is not rare in these group of countries the government deviates from its pre-declared policy path. The course of policy program becomes uncertain and agents

have to depend on unauthorized sources and rumors. In both the cases, the exact value of the net dividend flow becomes uncertain due to imperfectness of information.

To formalize these features let us introduce a random variable ξ, which is assumed to be normally distributed with mean 1 and a constant variance, σ_ξ^2. That is, $\xi \sim N(1, \sigma_\xi^2)$. When ξ is greater than unity ($\xi > 1$), the agent gets exaggerated information of the values of d_t and τ_t and on the other hand when ξ is smaller than unity ($\xi < 1$) the agent receives précised value of these variables. However, $\xi = 1$ implies perfect information.

Some additional assumptions are required regarding the random variable ξ.

6. Let us assume that ξ_t and u_t are independent to each other, which implies:

$$\left.\begin{array}{ll} \text{a. } E_t(\xi_{t+1}.u_{t+1}) = E_t(\xi_{t+1}).E_t(u_{t+1}) = E_t(u_{t+1}) \ [\because E_t(\xi_{t+1}) = 1 \text{ by assumption}] \\ \text{b. } Var(\xi_t.u_t) = \dfrac{\sigma_d^2}{1-\theta^2}[1+\sigma_\xi^2] \end{array}\right\} \quad (4)$$

Proof:

$$\begin{aligned} Var(\xi_t.u_t) &= [E_t(\xi_t)]^2 Var(u_t) + .[E_t(u_t)]^2 Var(\xi_t) + Var(u_t).Var(\xi_t) \\ &= [E_t(\xi_t)]^2 Var(u_t) + Var(u_t).Var(\xi_t) \\ &= Var(u_t)[1 + Var(\xi_t)] = \frac{\sigma_d^2}{1-\theta^2}[1+\sigma_\xi^2] \end{aligned}$$

7. ξ_t and e_t^r are also assumed to be independent. Hence,

$$\left.\begin{array}{ll} \text{a. } E_t(\xi_{t+1}.e_{t+1}^r) = E_t(\xi_{t+1}).E_t(e_{t+1}^r) = 0. \qquad [\because \lim_{t\to\infty} E_t(u_t) = 0] \\ \text{b. } Var(\xi_t.e_t^r) = \sigma_r^2[1+\sigma_\xi^2] \end{array}\right\} \quad (5)$$

Proof:

$$\begin{aligned} Var(\xi_t.e_t^r) &= [E_t(\xi_t)]^2 Var(e_t^r) + [E_t(e_t^r)]^2 Var(\xi_t) + Var(e_t^r)Var(\xi_t) \\ &= [E_t(\xi_t)]^2 Var(e_t^r) + Var(e_t^r).Var(\xi_t) \\ &= Var(e_t^r)[1 + Var(\xi_t)] = \sigma_r^2[1+\sigma_\xi^2] \end{aligned}$$

8. Further, let P_t be the price of a stock that the agent is ready to pay for each unit of an EME stock. The (expected) rate of return of a unit of stock, purchased at the beginning of period t at price P_t and sold at the beginning of period $(t+1)$ at price P_{t+1} has two components: (i) the net (net of 'τ') dividend earned and (ii) the (expected) capital gain. This implies,

$$r = \frac{P_{t+1} - P_t}{P_t} + \frac{\xi_t(d_t - \tau_t)}{P_t}$$

$$or,\ P_t = \left[\frac{1}{1+r}\right]\left[P_{t+1} + \xi_t(d_t - \tau_t)\right] \qquad (6)$$

Here, the expected rate of return, r is assumed to remain constant overtime. Even if we introduce fluctuating expected rate of return the main proposition of the model will remain unaltered. So, to avoid unnecessary computational complications r is taken to be fixed here. In presence of the possibility of arbitrage, r must be identical with the sum of risk free interest and risk premium. Setting $R = \left[\frac{1}{1+r}\right]$ and introducing the expectation operator we have.

$$P_t = R[E_t P_{t+1} + \xi_t(d_t - \tau_t)] \qquad (7)$$

This is an *Expectetional Difference Equation* and it owes some explanation. $E_t(P_{t+1})$ stands for expectation of P_{t+1} held at time t. That is, the expectation is formed based on a set of information from all public and private sources at time-t. This information set contains along with many other things all past values of P. d_t and τ_t are exogenous variables. R, the expected return from the stock market is assumed to be constant and considered as a parameter, whose value lies between 0 and 1 in this model.

These assumptions constitute the framework of the model. Following are the propositions of the model

Proposition: I

If the dividend from a domestic stock follows a well defined path with random fluctuation (which follows first order auto regression AR[1]) around it, any process of liberalization, which also has its own path with white noise disturbances, is not going to inject any additional volatility in stock prices, provided the agents behave rationally using all the information they have under a perfect information assumption, irrespective of existence of any speculative bubble.

Proposition: II

Uncertainty regarding the course of policy path and that of the earning from an asset often transmits imperfect information and 'noisy' signals to the agents thereby increasing the volatility of asset price.

3. Asset Price and Volatility under Imperfect Information

Under the set up of imperfect information, the demand price (P_t) of a unit of EME asset becomes

$$P_t = R[E_t P_{t+1} + (d_t - \tau_t)\xi_t] \tag{8}$$

Now let us solve the above problem recursively to find the time path for P_t

$$\begin{aligned} P_t &= R[E_t P_{t+1} + \xi_t (d_t - \tau_t)] \\ &= R[E_t P_{t+1} + \xi_t \{a(1+\gamma)^t + u_t - (\rho^t \tau_0 + e_t^r)\}] \end{aligned} \tag{9}$$

(Substituting the values of d_t and τ_t)

Pushing one period forward we have

$$\begin{aligned} P_{t+1} &= R[E_{t+1} P_{t+2} + \xi_{t+1}\{a(1+\gamma)^{t+1} + u_{t+1} - (\rho^{t+1}\tau_0 + e_{t+1}^r)] \\ &= R[E_{t+1} P_{t+2} + \xi_{t+1} a(1+\gamma)^{t+1} + \xi_{t+1} u_{t+1} - \xi_{t+1}\rho^{t+1}\tau_0 - \xi_{t+1} e_{t+1}^r)] \end{aligned} \tag{10}$$

Taking expectation conditional on information at time t in both the sides of the equation and using the relations of 4 and 5 we have,

$$E_t P_{t+1} = R[E_t P_{t+2} + a(1+\gamma)^{t+1} + E_t u_{t+1} - \rho^{t+1}\tau_0] \quad [\text{Assuming, } E_t E_{t+1} P_{t+2} = E_t P_{t+2}]$$

Substituting the above expression in equation 9 we have,

$$\begin{aligned} P_t &= R[R\{E_t P_{t+2} + a(1+\gamma)^{t+1} + E_t u_{t+1} - \rho^{t+1}\tau_0\} + \xi_t\{a(1+\gamma)^t + u_t - (\rho^t\tau_0 + e_t^r)] \\ &= R^2 E_t P_{t+2} + R^2 a(1+\gamma)^{t+1} + R^2 E_t u_{t+1} - R^2\rho^{t+1}\tau_0 + R\xi_t a(1+\gamma)^t \\ &+ R\xi_t u_t - R\xi_t \rho^t \tau_0 - R\xi_t e_t^r \\ &= R^2 E_t P_{t+2} + [R^2 a(1+\gamma)^{t+1} + R\xi_t a(1+\gamma)^t] - [R^2\rho^{t+1}\tau_0 + R\xi_t\rho^t\tau_0] \\ &+ [R^2 E_t u_{t+1} + R\xi_t u_t] - R\xi_t e_t^r \end{aligned}$$

Again pushing one period forward

$$\begin{aligned} P_{t+1} &= R^2 E_{t+1} P_{t+3} + [R^2 a(1+\gamma)^{t+2} + R\xi_{t+1} a(1+\gamma)^{t+1}] \\ &- [R^2\rho^{t+2}\tau_0 + R\xi_{t+1}\rho^{t+1}\tau_0] + [R^2 E_{t+1} u_{t+2} + R\xi_{t+1} u_{t+1}] - R\xi_{t+1} e_{t+1}^r \end{aligned}$$

Taking expectation conditional on information at time t in both the sides of the equation

$$E_t P_{t+1} = R^2 E_{t+1} P_{t+3} + [R^2 a(1+\gamma)^{t+2} + Ra(1+\gamma)^{t+1}]$$
$$-[R^2 \rho^{t+2} \tau_0 + R\rho^{t+1} \tau_0] + [R^2 E_t u_{t+2} + RE_t u_{t+1}]$$

Again substituting the above expression in equation 9 we have

$$P_t = R[\{R^2 E_t P_{t+3} + R^2 a(1+\gamma)^{t+2} + Ra(1+\gamma)^{t+1} - R^2 \rho^{t+2} \tau_0 - R\rho^{t+1} \tau_0 + R^2 E_t u_{t+2} + RE_t u_{t+1}\}$$
$$+ \xi_t \{a(1+\gamma)^t + u_t - (\rho^t \tau_0 + e_t^r)\}]$$

$$= R^3 E_t P_{t+3} + R^3 a(1+\gamma)^{t+2} + R^2 a(1+\gamma)^{t+1} - R^3 \rho^{t+2} \tau_0 - R^2 \rho^{t+1} \tau_0 + R^3 E_t u_{t+2} + R^2 E_t u_{t+1}$$
$$+ R\xi_t a(1+\gamma)^t + R\xi_t u_t - R\xi_t \rho^t \tau_0 - R\xi_t e_t^r$$
$$= R^3 E_t P_{t+3} + R^3 a(1+\gamma)^{t+2} + R^2 a(1+\gamma)^{t+1} + Ra(1+\gamma)^t - R^3 \rho^{t+2} \tau_0 - R^2 \rho^{t+1} \tau_0 - R\rho^t \tau_0$$
$$+ R^2 E_t u_{t+2} + R^2 E_t u_{t+1} + Ru_t + R\xi_t a(1+\gamma)^t - Ra(1+\gamma)^t + R\xi_t u_t - Ru_t - R\xi_t \rho^t \tau_0 + R\rho^t \tau_0 - R\xi_t$$
$$= R^3 E_t P_{t+3} + Ra(1+\gamma)^t [1 + Ra(1+\gamma) + R^2 (1+\gamma)^2] - R\rho^t \tau_0 [1 + R\rho + R^2 \rho^2]$$
$$+ [R^3 E_t u_{t+2} + R^2 E_t u_{t+1} + Ru_t] + (\xi_t - 1) Ra(1+\gamma)^t + (\xi_t - 1) Ru_t - (\xi_t - 1) R\rho^t \tau_0 - R\xi_t e_t^r$$

Proceeding in this way

$$P_t = \lim_{i \to \infty} R^i E_t P_{t+i} + Ra(1+\gamma)^t [1 + Ra(1+\gamma) + R^2 (1+\gamma)^2 + ...]$$
$$- R\rho^t \tau_0 [1 + R\rho + R^2 \rho^2 + ... + R^T \rho^T] + R \sum_{i=0}^{\infty} R^i E_t u_{t+i}$$
$$+ (\xi_t - 1)[Ra(1+\gamma)^t + Ru_t - R\rho^t \tau_0] - R\xi_t e_t^r \qquad (11)$$

From equation 2 $u_{t+1} = \theta u_t + e_{t+1}^d$

Now taking expectation conditional on information at time t

$E_t u_{t+1} = \theta u_t$; By repeated substitution we have $E_t u_{t+i} = \theta^i u_t$. Substituting the value of $E_t u_{t+i}$ for each $i=0, 1, 2, 3$.....in11 we find equation 12. Equation 12 happens to be the solution of the problem.

$$P_t = \lim_{i \to \infty} R^i E_t P_{t+i} + \frac{Ra(1+\gamma)^t}{1 - R(1+\gamma)} - R\rho^t \tau_0 \frac{[1 - (R\rho)^T]}{1 - R\rho} + Ru_t \frac{1}{1 - R\theta}$$
$$+ (\xi_t - 1)[Ra(1+\gamma)^t + Ru_t - R\rho^t \tau_0] - R\xi_t e_t^r \qquad (12)$$

Now, putting $\xi_t = 1$ we have the asset price under perfect information, which may be considered as the *true price of the asset, P**.

$$P_t = P^* = \lim_{t\to\infty} R^t E_t P_{t+1} + \frac{Ra(1+\gamma)^t}{1-R(1+\gamma)} - R\rho^t\tau_0\frac{[1-(R\rho)^T]}{1-R\rho} + Ru_t\frac{1}{1-R\theta} - R\xi_t e_t^r$$
$$\approx \lim_{t\to\infty} R^t E_t P_{t+1} + \frac{Ra(1+\gamma)^t}{1-R(1+\gamma)} - R\rho^t\tau_0\frac{[1-(R\rho)^T]}{1-R\rho} + Ru_t\frac{1}{1-R\theta} \qquad (13)$$

The transversality condition: $\lim_{t\to\infty} R^t E_t P_{t+1+i} = 0$

The transversality condition actually rules out the possibility of bubble.
Substituting the transversality condition we have the true value of the asset.

$$P_t = P^* = \frac{Ra(1+\gamma)^t}{1-R(1+\gamma)} - R\rho^t\tau_0\frac{[1-(R\rho)^T]}{1-R\rho} + Ru_t\frac{1}{1-R\theta} \qquad (14)$$

This expression owes some explanation. The first term in the right hand side of the above equation is the present value of the future flow of dividend, if it grows along its steady state growth trend. The last component depicts the effect of random fluctuation of the dividend on the price of the stock. We can sensibly assume that the dividend path gets some positive shock when the economy is in upswing and vice versa. It would not be very illogical to think this random component as a pro-cyclical element that fluctuates with the ups and downs of the business cycle, as profit and the rate of dividend fluctuates with the ups and downs of the business cycle. So, whenever the economy is in depression we can expect a negative u_t and vice versa. Another aspect is worth noting here. As $\frac{R}{1-R\theta} > 1$, any random fluctuation in the dividend path, however small it may be, leaves a greater impact on the price of the stock. This actually depicts the over reactive nature of any stock market. The second term shows the present value of the stream of successive 'tax' relives that one overseas investor expects, thanks to the liberalization program.

In the presence of Imperfect Information the time path would become:

$$P_t = P^* + (\xi_t - 1)[Ra(1+\gamma)^t + Ru_t - R\rho^t\tau_0] - R\xi_t e_t^r \approx P^* + (\xi_t - 1)[Ra(1+\gamma)^t + Ru_t - R\rho^t\tau_0] \qquad (15)$$

If the information is imperfect the asset price differs from that of the perfect in respect of the noise component. If the agent gets exaggerated value of the dividend and / or policy variable (i.e. $\xi_t > 1$) the $P_t > P^*$. Otherwise, if the agent gets précised or diminished value of the

asset (i.e. $\xi_t < 1$) the $P_t < P^*$. Thus we have shown how the imperfectness of information makes the asset price deviate from its true value.

Now let us turn our attention to the variability of the asset price. Taking variance of the true value of the asset in equation (14), we have:

$$Var(P^*) = \frac{R}{1-R\theta} Var(u_t) = \frac{R}{(1-R\theta)(1-\theta^2)} \sigma_d^2 = \sigma_S^2 \ (say)$$

Two points have to be noted from the above expression of the variance of the asset price under perfect information. First, the variance remains constant i.e. it is independent of any endogenous factor. Moreover there is no 'tax' element in the expression of the variance of asset price. This implies that the process of globalization does not affect the variability of the asset price of an EME, provided there is perfect information and rational expectation. This is an interesting outcome as it goes against the conventional wisdom. Generally it is argued that with financial globalization the prices of the assets of an EME become more volatile. Contrary to the conventional wisdom the results categorically prove that globalization of financial account of balance of payments does not inject any additional volatility. Secondly, the variance of asset price is independent of time. Both the findings are, however, true for perfect information.

(Proved, Proposition: I)

As the government starts to withdraw the restrictions on the flow of fund the chances of capital gain increases and the external funds move in. The rise in asset price, withdrawal of restrictions and the expectation for greater capital gain reinforce each other and fresh new portfolio capital comes in. Here we see that if the information regarding the change in policy flows in perfectly to the agents, there is no room for uncertainty and the volatility would remain unaltered.

$$Var(P_t) = Var(P_t^*) + R\sigma_\xi^2 \{a(1+\gamma)^t + \frac{\sigma_d^2}{1-\theta^2} - \rho^t \tau_0 - \sigma_\tau^2\} \qquad (13)$$

Thus we see that under uncertain state i.e. when the information passes imperfectly to the agents, the volatility rises compared to the case of perfect information. Moreover, the variability under the imperfect information is neither independent of the liberalization measures nor it is independent of time. We can say that:

$$\sigma_U^2 = Var(P_t) > Var(P_t^*) = \sigma_S^2$$

(Proved, Proposition: II)

Thus we see that if the information flows imperfectly, uncertainty in the asset market would lead to an increase in the volatility. If the government deviates from the pre-declared and well defined policy path it could inject additional volatility into the system. Again, if the business data published by the corporate is not enough trustworthy, it could also create uncertainty. What we tried to establish is that a rise in volatility after liberalization of capital account cannot be viewed as a result of the liberalization program; it may happen due to inadequate information. It actually infers that if empirical studies are made when the government is maintaining stability in the formulation and execution of policy, one would find a stable financial sector despite financial integration. Again, if the government is found to be weak and hesitant in formulating and executing the policies, there could be rise in volatility in asset market. The volatility in the asset market may also increase due to any exogenous shock, which forces the government to deviate from the policy path. Thus it is not possible to get any definite relationship between financial integration and asset price volatility unless one considers the aspect of information into the analysis.

4. Concluding Remarks

The quest of this paper is to find out how does the process of globalization affect volatility of the asset market in an EME. To this end, we have calibrated a theoretical model under the assumption of rational expectation. While reviewing the literature we find highly conflicting findings of the previous researchers. Some of the scholars found that financial globalization would result into an increase in volatility in the asset market of the EMEs. However, the findings of the some others are diametrically opposite. There are some works which actually try to focus that there could not be any definite relationship between globalization and volatility. Under this theoretical and empirical back drop our paper actually focuses under perfect information the volatility in the asset market will remain unaffected with the globalization. However, if the information flows imperfectly to the agents the volatility in the asset market will surely increase. Moreover, as we find in our model, the volatility of the asset market will increase overtime. Thus we find that it is the nature and quality of information which really matters not the globalization in itself. That is, if the concerned government is able to manage the process of globalization with necessary transparency such that the information passes perfectly to the agents, the possibility of the increase in volatility would be reduced. If the dividend from a domestic stock follows a well defined path with random fluctuation (which follows first order auto regression AR[1]) around it, any process of liberalization, which also has its own path with white noise disturbances, is not going to inject any additional volatility in stock prices, provided the agents behave rationally using all the information they have under a perfect information assumption, irrespective of existence of

any speculative bubble. Uncertainty regarding the course of policy path and that of the earning from an asset often transmits imperfect information and 'noisy' signals to the agents thereby increasing the volatility of asset price. What we tried to establish is that a rise in volatility after liberalization of capital account cannot be viewed as a result of the liberalization program; it may happen due to inadequate information. It actually infers that if empirical studies are made when the government is maintaining stability in the formulation and execution of policy, one would find a stable financial sector despite financial integration. Again, if the government is found to be weak and hesitant in formulating and executing the policies, there could be a rise in volatility in the asset market. The volatility in the asset market may also increase due to any exogenous shock, which forces the government to deviate from the policy path. Thus it is not possible to get any definite relationship between financial integration and asset price volatility unless one considers the aspect of information into the analysis.

So, we would like to advocate rule based policy regime, where the government is supposed to follow some pre-declared rule rather than situation based policy. This would help the agent in forming their expectation. The policy of the government is supposed to ensure that the private corporate declare their business statistics in time and in orderly manner. Auditing procedure should be maintained. As we have seen that maintaining perfect information is one of the prerequisites of stability in the financial sector.

End Note

1. Blanchard Oliver Jean and Stanley Fischer (1989), "Multiple Equilibria, Bubbles, and Stability" chapter 5 pp 213-274 Lectures on Macroeconomics. Prentice Hall of India Pvt. Ltd. – has showed a technique to solve the expectational difference equation. We have followed that methodology.

References

Agenor, Pierre-Richard (2003). "Benefits and Costs of International Financial Integration: Theory and Facts", *World Economy*, Vol. 26, No. 8 pp. 1089 – 1118.

Bekaert, Geert, Campbell, R. Harvey and Christian Lundblad (2004). "Growth Volatility and Financial Liberalization", *NBER Working Paper, 10560.*

—— (2006). "Growth Volatility and Financial Liberalization", *Journal of International Money and Finance*, Vol. 25, pp. 370 – 403.

Bhattacharyya, Saikat (2011). "Asset Price Volatility and Capital Account Liberalization" in Biswajit Chatterjee and Ashim Karmakar ed. *Captial Account Convertibility in India*, Deep and Deep Publications Pvt. Ltd., New Delhi, pp . 189 – 204.

Buch, Claudia M., Joerg Doepke and Christian Pierdzioch (2005). "Financial Openness and Business Cycle Volatility", *Journal of International Money and Finance*, Volume 24, Issue 5, pp. 744-765.

Edwards, Sebastian, Javier Gomez Biscarri and Fernando Perez de Gracia (2003). "Stock Market Cycles, Financial Liberalization and Volatility", *NBER Working Paper, 9817.*

Erturk, Korkut A. (2005). "Economic Volatility and Capital Account Liberalization in Emerging Countries", *International Review of Applied Economics*, Vol. 19, No. 4, October.

Henry, Peter Blair (2000b). "Do Stock Market Liberalizations Cause Investment Booms?", *Journal of Financial Economics*, Vol. 58, Issues 1-2, pp. 301-334.

Henry, Peter Blair (2000a). "Stock Market Liberalization, Economic Reform, and Emerging Market Equity Price", *The Journal of Finance*, Volume 55, Issue 2, pp. 529–564.

Jayasuriya, Shamila (2005). "Stock Market Liberalization and Volatility in the presence of Favorable Market Characteristics and Institutions", *Emerging Markets Review*, Volume 6, Issue 2, June, pp. 170-191

Krugman, Paul (2000). "The Return of Depression Economics", W.W. Norton & Company, New York.

Obstfeld, M. (1994). "Risk Taking, Global Diversification and Growth", *American Economic Review*, Vol. 84, pp. 1310 – 1329.

Santis, G. De and Selahattin (1997). "Stock Returns and Volatility in Emerging Financial Markets", *Journal of International Money and Finance*, Vol. 16, Issue 4, pp. 561-579.

Stiglitz, Joseph (2000). "Capital Market Liberalization, Economic Growth and Instability", Economic Development, Vol. 28, Issue 6, pp. 1075-1086.

Stiglitz, Joseph (2002). "Globalization and its Discontents", W.W. Norton & Company, New York.