On the Possible Impact of a Commodity Transaction Tax on India's Commodity Derivatives: An Empirical Study

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Introduction

One of the primary objectives of the development of futures markets is to promote fair price discovery of traded assets and to provide better hedging opportunities to investors. In the literature, there are two main issues that have been explored deeply in the case of commodity markets: the analysis of the price discovery process and the examination of volatility spillovers. Price discovery in the futures market implies the lead-lag relationship between futures and spot prices (see Tse, 1999; Zhong et al., 2004). Volatility spillover helps in investigating the flow of the information transmission process. More specifically, volatility spillover helps the regulators and investors to understand the process through which volatility in one market spills over to another market. In the context of commodity markets, the role of futures market is important because it helps the buyers as well as the sellers to manage their risk efficiently; the futures market provides an abundant scope of better risk management practices through proper production planning, marketing, rationalization of transaction costs, and risk diversification (see Hardaker, 2006; Liu and An, 2011). In the context of emerging markets, the introduction of the futures contracts in commodity markets is a new phenomenon. In recent years, owing to strong upheavals in commodity markets, the role of futures prices in the information transmission process has been one of the main topics of debate and discussion among academia, researchers, and regulators (see Mahalik et al, 2010). Consequently, the examination of the role of the commodity futures markets has become one of the fertile research terrains.

India, being a major producer of almost all of the globally traded commodities, has undertaken various measures to develop an efficient and competitive commodity trading platform.[1] Commodity futures trading in India started in 2003. Since then, there has been a considerable increase in the volume of agricultural commodities trading (see Srinivasan, 2008). Due to strong policy support, India's commodity platforms have started to play an important role in the information transmission process of various commodities such as bullion, metals, and energy products on international platforms. In its current market setting, the commodity market is regulated by Forward Market Commission, a statutory body that falls under the purview of the Ministry of Consumer Affairs. Commodity markets in India are classified under two categories. First, there are national level exchanges, including the National Commodity and Derivatives Exchange (NCDEX), Multi-Commodity Exchange (MCX), and National Multi-Commodity Exchange (NMCE). NCDEX is a dominant exchange in agriculture commodities and MCX leads in bullion, metals, and energy products. Second, are the Regional Exchanges, including the National Board of Trade (NBOT) and 20 other regional exchanges. At present, there are 22 exchanges operating in India that facilitate trading activities in approximately110 commodity items.

During 2008 and 2009, in a significant policy step, the government of India proposed a commodity transaction tax (CTT) amounting to 0.017% of trading value in its budget. This has been regarded as detrimental for commodity market development, as it may increase the transaction costs by more than 950%.[2] However, after deliberations, the government restrained itself from imposing the CTT owing to its potentially adverse consequences. Imposition of the CTT may negatively affect trading volumes and increase price volatility, as investors look for higher pre-tax returns. In addition, there are concerns that CTT imposition could thwart full price discovery in commodity markets and might make risk hedging more expensive. Nevertheless, the high fiscal deficit in the past few years is forcing the Indian government to look for new sources of tax revenues like the proposed CTT. Recently, there has been considerable debate among academics and researchers about the possible imposition of the CTT in order to augment tax revenues despite the potentially distorting effects on market microstructure. The government may further argue that the CTT could help to curb noise traders' activities in commodity markets. However, the argument of curbing excess volatility seems vague because empirical

evidence suggests that there is no such outcome and that the imposition of a transaction tax would impact the value traders even more than the noise traders in the market (see Roll, 1989; Grundfest and Shoven, 1991; Kupiec, 1996). Even the high-powered Abhijit Sen Committee (2008) has not supported the speculative nature of futures trading in commodity market very strongly. Further, the increase in tax revenue is subject to the realization of trade after the imposition of CTT. It could lead to deterioration of the market due to flight of investment to other international exchanges in the pursuit of better profit with lower CTT. Hence, due to dwindling volume, tax collections would be much lower than anticipated (see Edwards, 1993; Umlauf, 1993; Habermeier and Kirilenko, 2003).

Taking the above discussion as a starting point, the present study attempts to examine the possible impact of the proposed commodity transaction tax on trading volume and volatility. In doing so, we will answer the two fundamental questions. First, is it an appropriate time to impose the CTT in India's commodity derivatives markets? Second, if the CTT is imposed, what will the impact be on the development of the commodity derivatives market? The outcomes of this study are expected to provide important guidance for policy makers and researchers in undertaking market development-oriented policy measures.

Related Literature on CTT Imposition: Global Experience

A limited number of studies has examined the impact of a transaction tax on stock as well as commodity exchanges across the globe and have provided valuable inputs for market development. The proponents of transaction tax are of the view that the imposition of a transaction tax adds value to the government's exchequer that has wider welfare implications, particularly in an emerging markets context (see Kiefer, 1990). It may also help the regulators to curb speculative activities by discouraging the noise traders owing to the increased cost of trading and decreased excess volatility (see Summers and Summers, 1989; Stiglitz, 1989). However, opponents of the tax argue that the welfare dimensions of a transaction tax may be outweighed by its potential costs, as it will increase the cost of capital and may have a detrimental impact on trading volume, resulting in a significant reduction in market liquidity, while failing to reduce market volatility (see Grundfest and Shoven, 1991; Ericsson and Lindgren, 1992; Amihud and Mendelson, 1993; Kupiec, 1996; Saporta and Kan, 1997; Wang, Yau and Baptiste, 1997; Hu, 1998; Wang and Yau, 2000; Lo et al, 2004; Baltagi et al, 2006; Sahoo and Kumar, 2008 and 2011).

Some studies have empirically tested the impact of a transaction tax (security transaction tax, STT) on equity markets (see Umlauf, 1993; Saporta and Kan, 1997; Hu, 1998). With respect to the Taiwanese stock exchange, Chou and Lee (2002) provide positive evidence of a reduction of tax on the market efficiency and liquidity of the Taiwanese Futures Exchange (TAIFEX). In a similar vein, Hsieh (2004) points out similar empirical evidence in the case of TAIFEX. These studies broadly conclude that transaction taxes have strong implications for the price discovery process, volatility, and liquidity.[3] Using futures data, Aliber et al. (2003) find a positive relationship between transaction costs and volatility, and a negative relationship between trading volume and transaction costs in the foreign exchange futures market for the British Pound/USD, Japanese Yen/USD, and Swiss Franc/USD. Chou and Wang (2009) find an inverse relationship between a transaction tax and trading volume and a positive relationship between a transaction tax and bid-ask spreads. In the Indian context, a study by Sahoo and Kumar (2008 and 2011) provides an important insight about the possible role of commodity futures markets in price discovery and hedging opportunities. Using various models, their study investigates the possible impact of imposition of CTT on liquidity and volatility. They broadly conclude that there would be a negative impact on market liquidity and a positive impact on market volatility. Their results imply that the imposition of a CTT will lead to higher volatility and lower trading activity, which would affect market efficiency and liquidity considerably. Some studies have examined the impact of a transaction tax on governments' tax revenue. For

example, Edwards (1993) concludes that a tax on futures markets would not generate substantial tax revenues, but it would increase bid-ask spreads and might shift trading volume to overseas markets, weakening the international competitiveness of the U.S. commodity futures markets. In the case of Sweden, Umlauf (1993) finds that a transaction tax would have a negative impact on capital gains revenues.

It is apparent from the literature that there is mixed evidence on the exact implications of a transaction tax with regard to liquidity and volatility. There is very limited literature on this subject and hence it requires immediate attention to keep the discussion active in light of the increasing role of equity and commodity markets. Particularly, with respect to futures markets, very few studies have examined the role of a transaction tax on futures trading activities in an emerging markets context. Hence, the present study makes a novel attempt to examine the possible impact of a transaction tax on liquidity and volatility in an emerging market such as the Indian commodity futures market.

Empirical Methodology

We have broadly followed the methodology adopted by Aliber et al (2003), Wang and Yau (2000), and Sahoo and Kumar (2011). We have basically analyzed the impact of CTT on trading volume and volatility by utilizing the Vector Auto Regression-based Impulse Response Function (VAR-IRF). Following the above-mentioned studies, we consider Bid-Ask Spread (BAS) as a proxy for an increase in the transaction costs. Using intra-day data, we calculate the BAS as (ask-bid)/ (bid+ask). Under a multivariate framework, the VAR model helps in analyzing the inter-relationship among study variables by way of analyzing the changes in its own lags and changes in the lags of other variables. It is particularly useful when we are not sure about whether variables included in the model are endogenous or exogenous. Under an unrestricted VAR framework, we treat each variable symmetrically and do not impose any a priori restrictions on structural relationships.[4]

Sahoo and Kumar (2011) use the IRF to analyze the response of one particular variable to innovations in another variable. In a VAR model, IRF is used as a way to visually represent the behavior of one variable in response to the various shocks. In other words, it traces out the effects of a one-time shock to one of the innovations on current and future values of the other endogenous variables. We write our VAR specification as follows:

$$Z_t = A_1 Z_{t-1} + ... + A_p Z_{t-p} + \varepsilon_t \qquad (1)$$

Where Z_t is a vector of endogenous variables viz., [BAS, OI, TV and IV], A_p is a coefficient matrix with P lag. ε_t is a white-noise term. Before computing the IRF, we first confirm the co-movement behavior among study variables. In order to compute the IRF, we compute the orthogonalized residuals of VAR system through Cholesky decomposition.[5] As mentioned above, the order of endogenous variables included in the model are BAS, OI, TV and IV. OI is the open interest, TV is the trading volume, and IV is the intraday volatility. Following Anderson et al. (2001), we calculate the intra-day volatility as:

$$\hat{\sigma} = \sqrt{\sum_{t=1}^{n} (r_t)^2} \times 100 \qquad (2)$$

Where *n* is the number of trading day five minutes returns. $r_t = (\ln(M_t) - \ln(M_{t-1}))$, is the five-minute intra-day return. *M* is the midpoint bid and ask of the t^{th} trade at the end of the five-minute interval. This measure of volatility is used to capture the strong variability in the bid and the ask. BAS is expected to have a negative impact on trading volume because it represents a major component of the transaction cost. A higher transaction cost will discourage the market participants from trading in the market and, therefore. it can be considered a market-distorting factor (see Aliber et al, 2003; Chou and Wang, 2009). As discussed earlier, an increased transaction cost leads to an increase in volatility and a reduction in liquidity (see Sahoo and Kumar (2008).

	ADF					PP			
	TV	IV	BAS	OI		TV	IV	BAS	OI
Cardamom	-5.28**	-6.56**	-18.94**	-3.89*		-12.25**	-33.25**	-36.95**	-3.16*
Copper	-5.78**	-32.90**	-27.12**	-8.40**		-45.63**	-44.80**	-30.00**	-16.45**
Crude oil	-3.55**	-31.92**	-29.95**	-2.56		-26.67**	-36.38**	-36.47**	-11.44**
Gold	-6.51**	-36.04**	-35.98**	-10.16**		-41.20**	-36.04**	-35.98**	-19.61**
Refined Soya oil	-8.14**	-13.39**	-11.24**	-6.60**		-18.54**	-31.03**	-35.57**	-5.96**

Note: * and ** indicate the level of significance at 1% and 5% respectively.

Exhibit 1 Unit Root Results

Source: Author's calculations

Data

In this study, we have used intra-day futures price data and daily trading activity data (OI and TV) of MCX. As mentioned previously, we calculate the BAS and IV from the intra-day (five-minute interval data). We have considered five commodities from four categories in our study: gold from precious metals, copper from basic metals, crude oil from energy products, cardamom, and refined soya oil from agricultural commodities.

All five commodities have a large share in the total trade at MCX. The sample period of each commodity is as follows: Cardamom (February 24, 2006 to December 31, 2010; 1,426 observations); Copper (January 4, 2006 to December 31, 2010; 1,486 observations); Crude oil (January 4, 2006 to December 31, 2010; 1,515 observations); Gold (January 4, 2006 to December 31, 2010; 1,478 observations); Refined Soya Oil (January 4, 2006 to December 31, 2010; 1,279 observations).

Empirical Results

Before the estimation of the VAR model, we check for the stationarity properties of each variable under consideration. Exhibit 1 shows the unit root results of the Augmented Dickey Fuller (ADF) and Phillips and Perron (PP) tests.

The results of the ADF test confirm that all variables are stationary at level except for the OI of crude oil, which is further confirmed by the PP test as being stationary. Since all sample series are I(0), we estimated the VAR model. Before estimating IRFs, we calculated the correlations among the residuals of the VAR equations. The correlation results confirm a negative relationship between BAS and TV and a positive relationship between BAS and IV (see Exhibit 2).

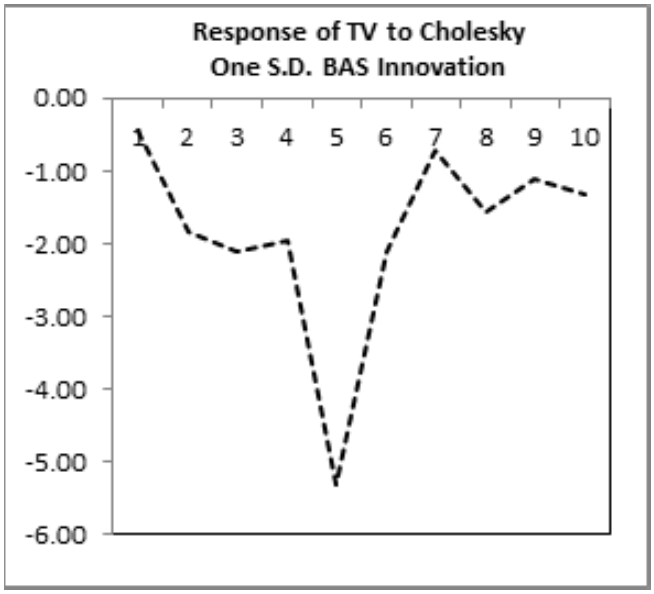
	BAS	OI	TV	IV
Cardamom				
BAS	1.00	-	-	-
OI	0.01	1.00	-	-
TV	-0.01	0.40	1.00	-
IV	-0.06	0.05	0.21	1.00
Copper				
BAS	1.00	-	-	-
OI	0.05	1.00	-	-
TV	0.00	0.17	1.00	-
IV	-0.06	-0.04	-0.02	1.00
Crude oil				
BAS	1.00	-	-	-
OI	-0.04	1.00	-	-
TV	-0.05	0.51	1.00	-
IV	-0.04	0.02	0.03	1.00
Gold				
BAS	1.00	-	-	-
OI	0.02	1.00	-	-
TV	-0.02	0.11	1.00	-
IV	-0.10	0.02	0.02	1.00
Ref. Soya Oil				
BAS	1.00	-	-	-
OI	-0.12	1.00	-	-
TV	-0.17	0.49	1.00	-
IV	0.19	-0.14	0.01	1.00

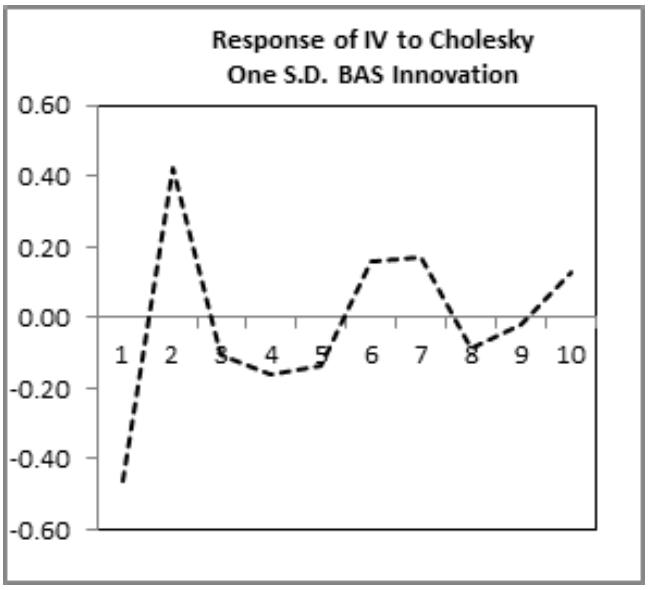
Exhibit 2 Correlation Matrix of VAR Residuals

Source: Author's calculations

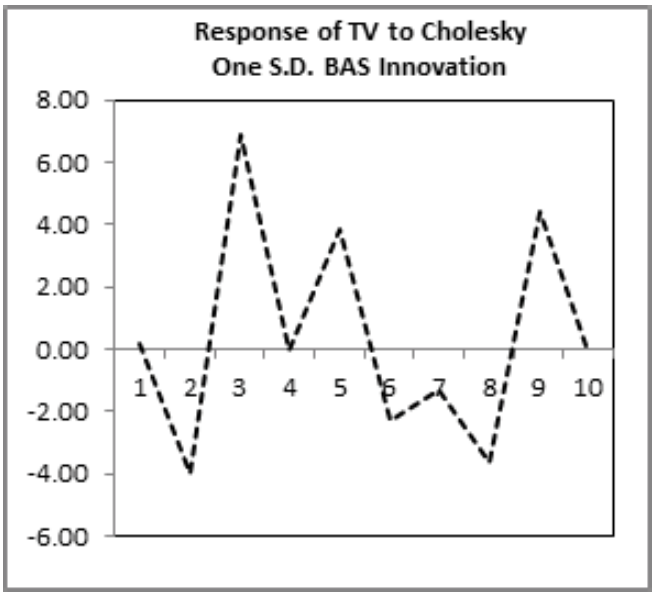
We further calculated the IRFs from the VAR estimation. The results of Cholesky decomposition based IRF up to 10 (days) periods for five commodities are shown in Exhibit 3. Since the objective of this study is to find out the impact of a tax increase on trading volume and volatility, the impulse responses of a one-standard deviation shock of BAS to TV and IV are presented. It can be observed that a one-standard deviation shock to BAS increases volatility and decreases volume for all of the commodities considered in this study. Analyzing

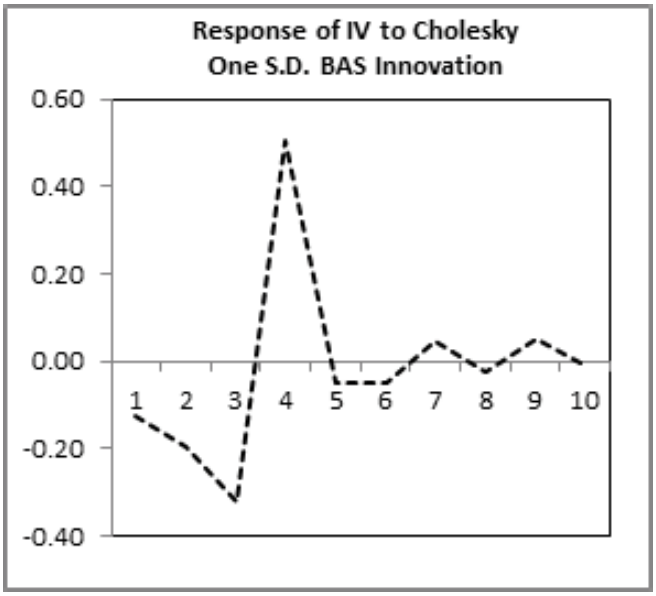
the commodities individually, we find that in the case of cardamom, a one-standard deviation shock of BAS in the first two periods leads to a decrease in trading volume for all ten periods, with the sharpest decline being observed between the fourth and seventh periods. These results imply that the exogenous shock in BAS leads to a considerable decrease in the volume of trading. It may be noted that with the exception of copper and gold, which exhibit fluctuating patterns in their trading volumes, a one-standard deviation shock leads to a decline in trading volume throughout the periods analyzed. This implies that a one-standard deviation shock to BAS leads to a persistent decline in the trading volume of international as well as agricultural commodities. This finding lies in contrast to the findings of Sahoo and Kumar (2011). In terms of intra-day volatility, the IRF graphs indicate more or less fluctuating behavior with frequent ups and downs, but all of the graphs are tilted towards positive volatility, with the exception of refined soya oil. The results suggest that a one-standard deviation shock to BAS induces intraday volatility for the first two periods and then depicts a cyclical trend of ups and downs.





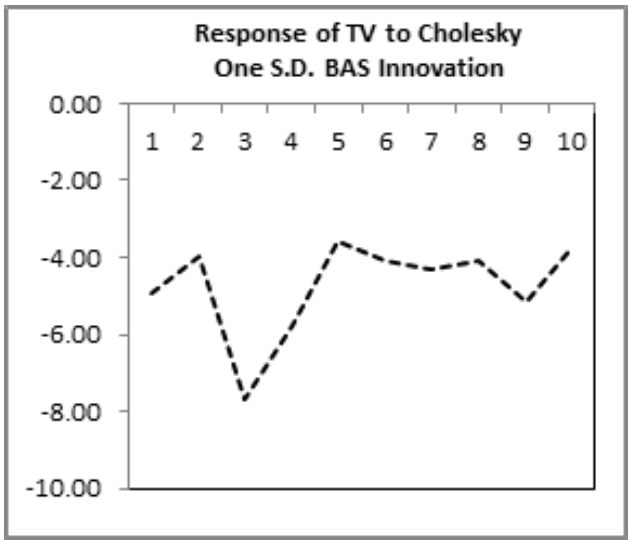
A. Cardamom

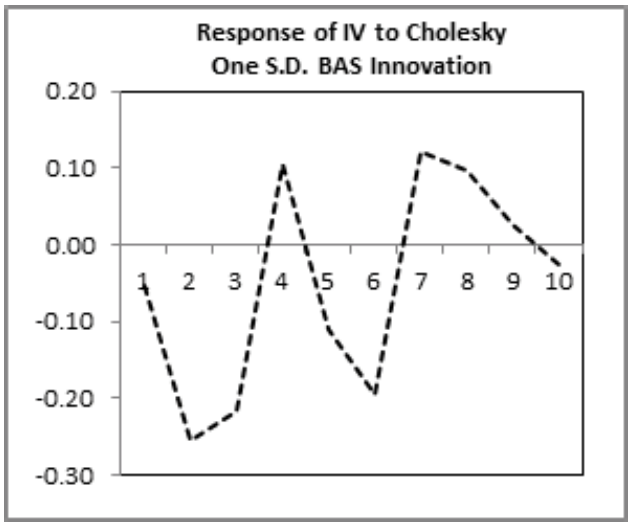




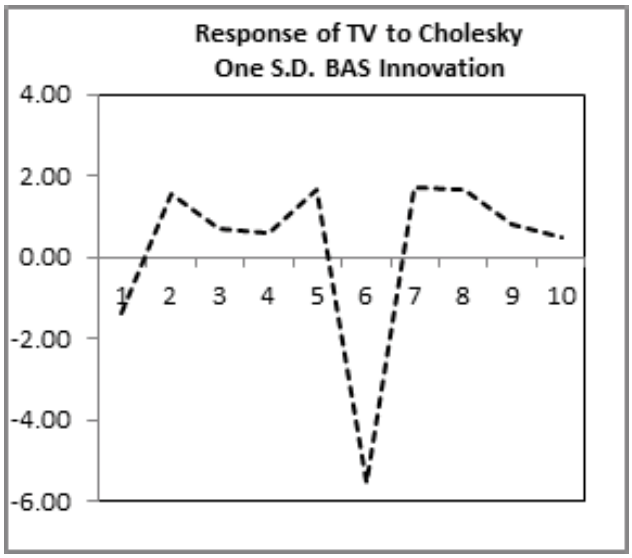
B. Copper

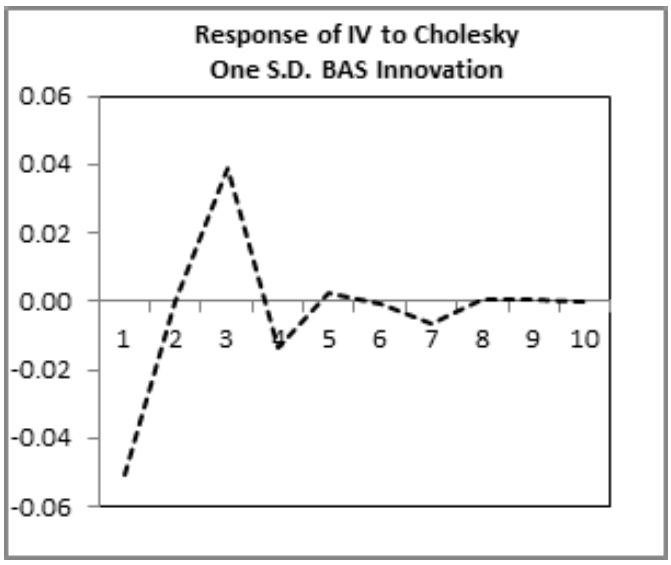
Exhibit 3 Impulse Response Results
Source: Author's calculations



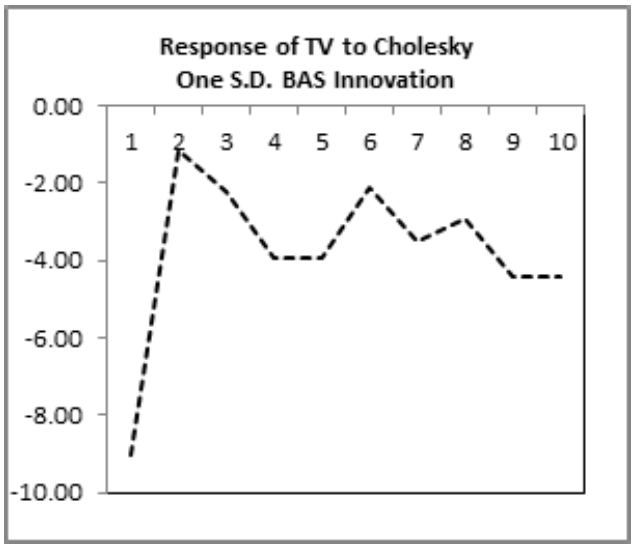


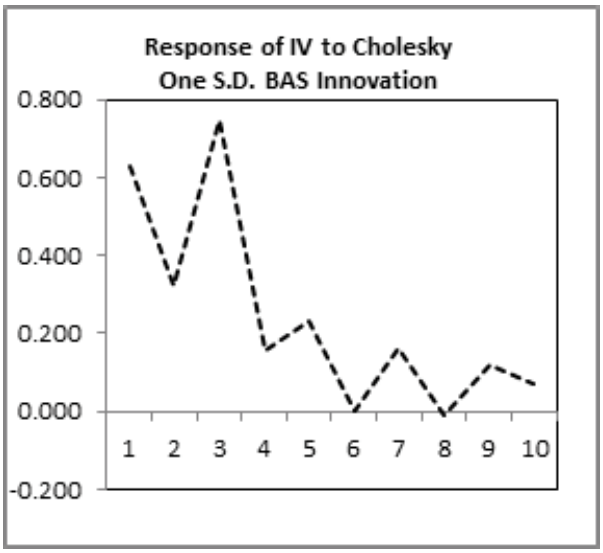
C. Crude Oil





D. Gold





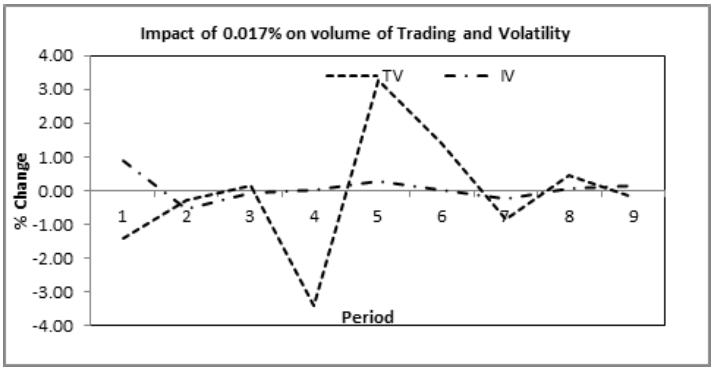
E. Ref. Soya Oil

Exhibit 3 (Continued) Impulse Response Results

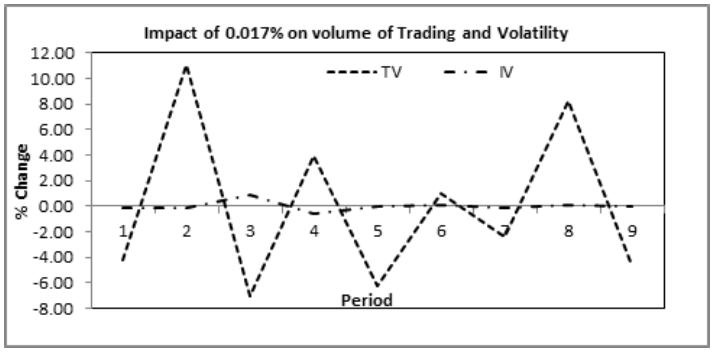
Source: Author's calculations

We now turn to analyze the impact of a probable CTT imposition of 0.017% on trading volume and intraday volatility. The results presented in Exhibit 4 indicate that the increase or decrease in either trading volume or intraday volatility is measured along the x-axis. It is observed that an increase in transaction tax would result in a considerable decrease in market depth and an increase in volatility. Broadly speaking, it can be inferred that the increase in transaction costs will certainly make the market less liquid and relatively more volatile. In the case of Cardamom, for example, an increase in the transaction tax would cause daily trading volume to decline by around 2 to 3% between the first and fourth periods. The highest decline is observed in the case of copper at about 4% in the first period and the highest decline throughout the examined period is observed in the case of gold at about 8%.

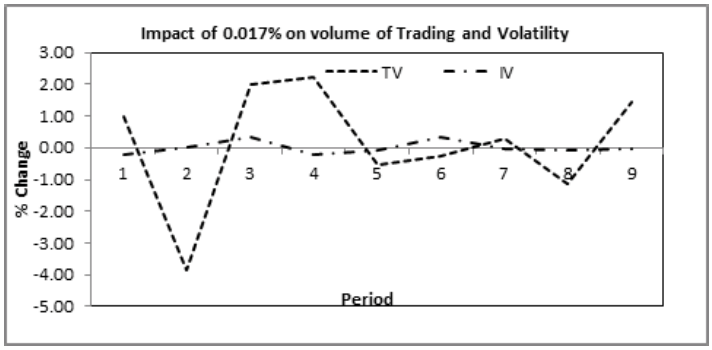
At the same time, these commodities have shown fluctuations in their trading volume, which sometimes increases between 3-8% in some periods. We conclude that the impact of a CTT is much more significant with regard to trading volume than to volatility for sample commodities. The impact of a tax increase appears to be stronger for internationally traded commodities and for agricultural commodities. Hence, any imposition of a transaction tax would result in a considerable decrease in market liquidity and an increase in volatility. The findings of this study are in agreement with the studies by Aliber, Chowdhry, and Yan (2003), and Chou and Wang (2006).



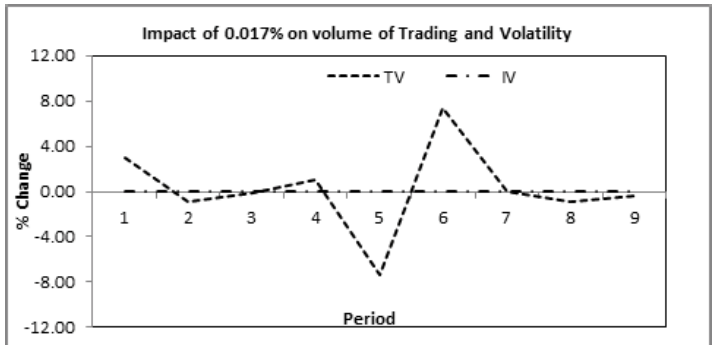
A. Cardamom



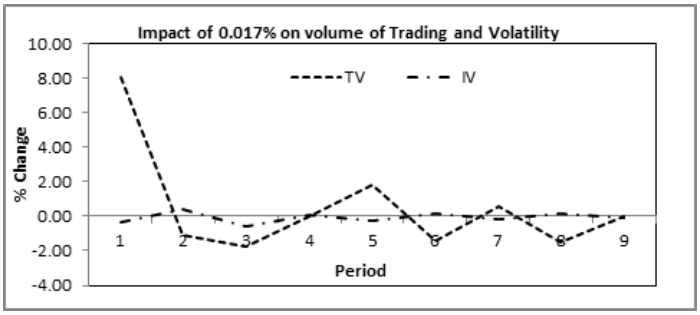
B. Copper



C. Crude oil



D. Gold



E. Refined Soya Oil

Exhibit 4 Impact of Tax Increase on Various Commodities

Source: Author's calculations

Conclusion and Discussion

In this paper, we have analyzed the relationship between bid-ask spreads, futures market trading activity, and intra-day futures price volatility for five commodities. Analyzing multivariate VAR based IRFs, we find a negative relationship between bid-ask spreads and trading volume and a positive relationship between bid-ask spreads and intraday volatility. We re-examined these relationships under the possible scenario of an imposition of a CTT set at 0.017%. The CTT will increase the transaction costs and therefore we factor it into the bid-ask spreads. We find that any such tax imposition will have an adverse impact on trading volumes by making them fluctuate to a great extent, although it may not significantly change the price volatility in those commodities. Our findings are in conformity with most international studies. We recommend that the government abstain from imposing CTT under the current scenario, when most global markets are removing and reducing taxes to make their trading platforms more competitive. In the era of low economic growth, any flight of capital from market platforms should be avoided. Further, owing to its adverse impact on market liquidity, the CTT will reduce the pricing efficiency of the Indian commodity market. The CTT could also make the price risk management exercise more expensive and, by impacting futures price volatility, might also create inflationary pressures due to the linkage between futures and spot price volatility. Price discovery and risk management are the primary functions of trading platforms and not merely vehicles for fiscal collections. Fiscal collections should be a byproduct of increased activity and a source of income and employment generation through these trading platforms. Therefore, it is advised that the government make an active effort in the development of commodity trading platforms in India by providing them with infrastructure and fiscal incentives and making these markets more price competitive. Being an emerging market, as well as a major producer and consumer of most commodities, India should realize the importance of taking a lead in an era of global markets.

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Endnotes

1. Sahoo and Kumar (2011) provide an excellent overview on the history of the Indian commodity market development and its status in the global marketplace.

2. The proposed tax is expected to increase the total transaction tax from Rs. 20 per million to Rs. 190.25 per million.

3. For further reference on this subject, review articles of Habermeier and Kirilenko (2003) and Norden (2009).

4. We have decided the optimal lag length based on the Akaike Information Criterion (AIC).

5. For further details, Enders (2004) could be a good reference in order to understand the VAR system.

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