Factors Affecting Changes in Broker Credit Directives in the Colombo Stock Exchange of Sri Lanka

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Abstract

Regulators use changes in market credit directives to control the potential destabilizing speculative behavior of investors and to inhibit excessive stock market volatility. This paper investigates macroeconomic and market factors associated with regulatory changes in broker credit directives in the Colombo Stock Exchange of Sri Lanka. We use a unique sample of changes in broker credit directives issued by the Securities and Exchange Commission of Sri Lanka during the high volatility period from 2010 to 2012 and employ a probit regression model to examine the factors affecting changes in such directives. We find that inflation, industrial production growth, trading volume, and market volatility significantly impact changes in broker credit directives. Although stock market returns and growth in broker credit volumes show no impact standing alone, they exert an important influence together. The SEC's regulatory actions on broker credit seem to be driven by market volatility, stock returns, and growth in broker credit volume.

JEL classification: G10, G12, G18, G24

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1. Introduction

This paper examines the factors affecting changes in broker credit directives issued by the Securities and Exchange Commission of Sri Lanka (SEC). Through the issuance of periodic directives, the SEC controls the duration and the amount of credit given to investors by stockbrokers for stock market transactions. The SEC does not provide a specific rationale when issuing changes to broker credit directives. Therefore, it remains an empirical question as to whether such changes to broker credit are driven by factors relating to the stock market and the country's macroeconomic environment. We empirically investigate whether broker credit changes are associated with several market and macroeconomic variables to shed light on the potential rationale underlying such broker credit changes in the Sri Lankan stock market.

Our study attempts to empirically identify the factors that drive changes in credit directives in the Sri Lankan stock market. The existing literature mainly examines the effects of changes in margin requirements and not broker credit controls. Hence, the current study will open a new research paradigm relating to the change in broker credit directives.

To examine the research problem, we used the Binary Probit Regression model. Similar to Hardouvelis (1990), our dependent variable is categorical and dichotomous with two state changes of credit directives. Hence, using the Probit model, we intend to find the independent variables with the highest probability of explaining the changes in the dependent variable. Our study has two categories of independent variables: macroeconomic factors such as growth in the Industrial Production Index, and inflation, and market factors such as stock returns, growth in trading volume, growth of the ratio of broker credit to the value of the stock market index, and stock market volatility. It is observed from the past regulatory announcements that the credit directive changes in Sri Lanka have occurred after the post-war period starting from the year 2010. However, the Sri Lankan market has not experienced any credit directive changes after 2012 amidst low market volatility conditions (Figure 1). Hence, the sample period is restricted to the period covering 2010 to 2012.

The results suggest that the changes in credit directives are associated with macroeconomic and market factors. Importantly, our results show that the SEC is most likely to respond to the simultaneous growth in stock market returns and broker credit volumes in the market. We define this market situation as "destabilizing investor speculation." Our analysis also presents evidence that the SEC is likely to change credit directives in response to other market conditions that could cause market instability, such as increasing trade volumes and market volatility.

The remainder of the paper is organized as follows. Section 2 provides a brief overview of past research on the association of stock market credit directive changes with several market and macroeconomic variables. Sections 3 and 4 describe the sample and methodology used in this study. Section 5 discusses the results, and Section 5 provides the summary and conclusions.

2. Literature review

Stock market volatility affects asset prices and investment returns. Stock market volatility is driven by many firm-specific, market, and macroeconomic factors. The availability of credit to investors and the use of leverage by them could lead to excessive market volatility. Schwert (1990) argues that investors' abuse of stock market credit destabilizes the market and causes prices to move away from fundamentals. Therefore, it is plausible that controlling the credit available to investors would help control excess upswings or downswings of security prices.

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Among the many ways regulators limit trading activity, the changes in the broker credit directives are widely seen as an important tool available to market regulators. Kumar et al. (1991) argue that speculative trading strategies of investors could easily be managed by changing the broker credit directives in the market.

Since market volatility is influenced by a multitude of factors, the effective use of credit directives as a policy tool to control market volatility will depend on the underlying causes that prompt such market volatility. Cohen (1966) highlights several factors that cause changes in stock market credit directives. They include the volume of credit, economic conditions, volume of speculative activity, stock price fluctuations, short-term bank rate on business loans, and the gross national product representing the general economic conditions.

A relation between market credit directives and macroeconomic variables can be expected because emerging markets are highly impacted by changes in macroeconomic conditions (Peiris & Peiris, 2007). Hardouvelis and Peristiani (1990, 1992) indicate that macroeconomic variables do not influence the SEC to change the margin requirements in the U.S. stock exchanges. On the other hand, Engle et al. (2013) suggest that macroeconomic factors highly influence market behavior. Brumm et al. (2015) also suggest that regulators frequently change stock market credit directives in response to economic conditions in the country. Since Sri Lanka is an emerging market, it is likely influenced greatly by macroeconomic conditions, and regulators might consider macroeconomic conditions when making decisions on credit directives.

Moreover, Hardouvelis (1990), and Hardouvelis and Theodossiou (2002) argue that the regulatory decisions to change stockbroker credit directives are not related to the current volatility of equity markets. They suggest that volatility itself had not been a reason to change margin requirements in the U.S., but other macroeconomic and market variables that caused volatility influenced such changes. These factors include rising stock returns, rapid expansion in stock market credit, high trading volume, inflationary pressure, and an expanding economy. The decision to decrease credit directives is due to a drop in stock market credit and the disappearance of these factors. According to Salinger (1989), the main reason for the regulatory change in the stockbroker credit directives is the change in stock prices beyond their fundamentals. Largay (1973) concludes that the market had shown a bullish trend before the imposition of margin requirements.

The changes in credit directives by the Sri Lankan SEC were motivated by factors such as promoting retail investor participation, avoiding force selling, stopping the rising prices, stopping speculative stock bubbles, managing risk, etc.[2] It is further observed that market volatility itself had not been the only reason for the credit directive changes. Hence, this paper attempts to empirically investigate the factors associated with changes in broker credit directives with reference to a period of high market volatility in Sri Lanka.

3. Data and sample

Broker credit facilities are similar to margin facilities, where the SEC allows the licensed stock brokering companies to grant credit to its investors under the terms and conditions set by the brokering company. The directives on the broker credit facilities are set by the SEC under Section 07 of the Securities & Exchange Commission of Sri Lanka Act No. 36 of 1987 (SEC Act). These firms are allowed to extend credit three times the adjusted net capital of the stock brokering firm. Such credit facilities are secured by the securities held in the Central Depository

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[2] Daily FT (19.08.2011,12.01.2012) and Daily Mirror (17.07.2012,09.10.2012,10.10.2012)

System (CDS) account of the investor. In Sri Lanka, the credit extended to a single client is limited to 50% of the market value of the securities held in the client's account. If the market value of the securities falls by 25%, then the brokering company can inform the client to liquidate and meet the shortfall. In the event the client cannot meet the demand, the brokering firm will force-sell the securities to meet the shortfall. Upon the extension of credit, the brokering firm should limit its single client exposure to 15% of the total value of the credit extendable by the firm.

The extension of broker credit in Sri Lanka gained popularity with the increased investor participation experienced after 2010. There were no broker credit directive changes before 2010. However, starting from 2010, the SEC has introduced several directives to manage broker credit available to investors. After 2012, as the market was normalizing (see Figure 1), the SEC has not seen the need to regulate broker credit extended to investors. Therefore, we collected the credit directives and their dates issued by the Sri Lankan SEC during the period from 2010 to 2012. There had been a total of nine credit directive changes during this period (see Table 1).

Figure 1

Monthly Market Volatility

Note: The marked period represents the period from 2010-2012 where the credit directive changes have taken place in Sri Lanka
Source: Author compiled based on CSE directives

The SEC introduced directives to restrict and loosen broker credit. For instance, regulators controlled the credit availability by limiting the credit extension period to T+3 days or force-selling the securities on credit beyond T+5. There were also times that the directives focused on controlling the credit extension based on the net capital of brokers to limit the overall credit available in the market. Most commonly, the directives were set to reduce the debtor position of brokering firms to control the credit availability and the resultant excess market volatility.

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Table 1

Summary of Broker Credit Changes

|	Date (DD/MM/YYYY)	Directive
1	14/09/2010	Broker firms are advised to refrain from extending credit to any investor for a period beyond T+3 days. If the credit is to be extended beyond this period, it must be through a Margin Provider.
2	29/11/2010	In compliance with the above, brokers must reduce the current debtor position at least 50% by 31st March and 100% by 30th June 2011. This decision is made as a consideration of granting the small-time investors additional time to clear their outstanding positions.
3	29/12/2010	Broker firms are advised to force-sell by T+5, securities of buyers which are in default settlement by T+3 days in order to recover the monies owing to them by such defaulting clients with effect from 1st January 2011.
4	21/02/2011	Broker firms' overall value of the loans extended to investors should not exceed 4 times the value of net capital.
5	19/05/2011	With reference to 29/11/2010, 25% of the remaining debtor balance should be cleared by 30/09/2011 and balance 25% of the debtor balance to be cleared by 31/12/2011. This relief is granted based on the improved market conditions.
6	16/08/2011	Relax the restriction on broker credit facilities to facilitate retail investors to have access to credit. Permit T+3 credit based on liquid assets less obligations.
7	17/01/2012	Limit credit up to 3 times adjusted net capital (net capital less 50% fixed assets) of the broker firm.
8	18/07/2012	The stockbrokers will now get the opportunity to provide less to the debtors after stipulated settlement dates. Debtors between T+3 and T+30 (Trade Day+) calendar days to be deducted if cost less provisions made for the period is greater than the market value. Stockbrokers are now permitted to provide only 50 percent of the net exposure (cost less provision) if the debtors are over T+30. T+120 100% cost less provisions
9	09/10/2012	Adjustment to the net adjusted capital calculation to relax the credit granted by brokering firms to their clients

Source: The directives of the Securities and Exchange Commission of Sri Lanka.

This study uses the All-Share Price Total Return Index (ASPTRI) of the Colombo Stock Exchange to measure total market returns. Sri Lanka experienced a protracted civil war that lasted from 1983 to 2009. As Figure 1 shows, the stock market volatility increased significantly after the war during the three years from 2010 to 2013. The average monthly standard deviation of market returns was 0.50% during the 2005 to 2009 period. It rose to 0.79% during the post-war period from 2010 to 2013. It is during this high volatility period that the SEC issued

changes in broker credit directives. As such, the sample period of our study covers the high market volatility period of 36 months from 2010 to 2012 when the credit directives occurred.

Figure 2

Monthly Trading Volume
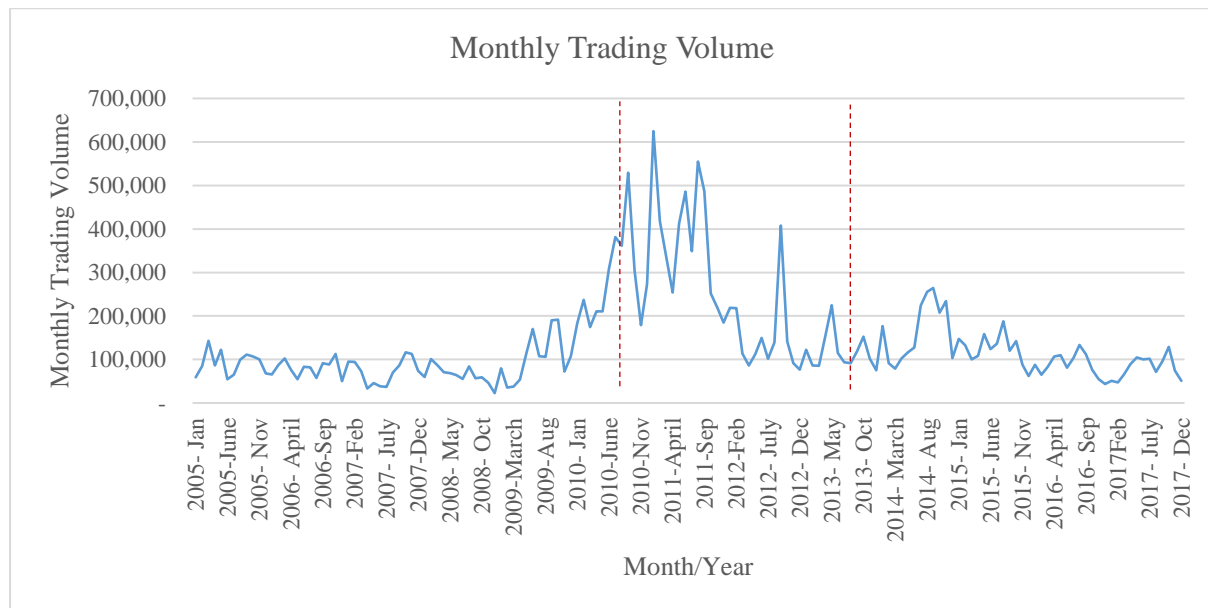
Note. The marked period represents the period from 2010-2012 where the credit directive changes have taken place in Sri Lanka
Source: Author compiled based on CSE directives

Figure 2 depicts the trade volumes over the period from 2005 to 2017. During the war period from 2005 to 2009, the CSE recorded an average monthly trading volume of 81,740 shares. Trade volumes almost doubled during the post-war period starting from 2010 due to the increased investor confidence and participation.

As for potential factors that may influence changes in broker credit directives, consistent with Cohen (1966), Hardouvelis (1990), and Hardouvelis and Theodossiou (2002), this study identifies market and macroeconomic variables as possible factors influencing broker credit changes. We use inflation and growth in the Industrial Production Index published by the Central Bank of Sri Lanka (CBSL) to capture macroeconomic conditions. Inflation is measured by the changes in the Colombo Consumer Price Index (CCPI), and the industrial production growth is measured by changes in the Industrial Production Index. To capture market-related factors, the study uses the market returns, growth of broker credit, and increase in trading volume of the CSE. The market data are collected from CSE monthly reports. The aggregate monthly broker credit outstanding is compiled from the amount of credit extended by individual stockbrokers. Further, market volatility is used as an important factor to see if the SEC decisions have been associated with recent market volatility. All variables are measured monthly.

4. Methodology

To examine the factors associated with broker credit changes, this study specifies the following probit regression model:

$$y = \alpha_0 + \alpha_1 I_{t-1} + \alpha_2 IP_{t-1} + \alpha_3 R_{t-1} + \alpha_4 BCG_{t-1} + \alpha_5 TV_{t-1} + \alpha_6 \delta^2_{t-1}$$
$$+ \alpha_7 R_{t-1} * TV_{t-1} + \alpha_8 R_{t-1} * BCG_{t-1} \qquad (1)$$

The dependent variable *y* is a dichotomous variable. The status of stock market broker credit directives was categorized as "change in broker credit directives" and "no change in broker credit directives." It is equal to 1 if broker credit directive changes and zero otherwise. Hardouvelis (1990) used lagged values of the independent variables to avoid possible autocorrelation problems among variables. Accordingly, all independent variables are specified with one lag. I_{t-1} is the lagged inflation rate, IP_{t-1} is the lagged industrial production growth rate, R_{t-1} is the lagged market return, BCG_{t-1} is the lagged broker credit growth rate, TV_{t-1} is the lagged change in market trading volume, and δ^2_{t-1} is the lagged market volatility. Further, to capture the combined effect of returns and trading activity, and returns and broker credit growth, we specify two interaction terms $R_{t-1} * TV_{t-1}$, and $R_{t-1} * BCG_{t-1}$ respectively.

Following Hardouvelis (1990), market returns are specified as continuously compounded real returns which are calculated by adjusting nominal returns for inflation as given in Eqn. (2) below:

$$R_t = \ln\left(\frac{ASPTRI_t}{ASPTRI_{t-1}}\right) - \ln\left(\frac{CCPI_t}{CCPI_{t-1}}\right) \qquad (2)$$

where, ASPTRI is the All-Share Price Total Return Index, and CCPI is the Colombo Consumer Price Index. The monthly volatility is calculated as rolling volatility based on 36-months of monthly returns.[3]

5. Results

5.1 Descriptive statistics

Table 2 shows the descriptive statistics of the variables. The average monthly stock market return over the 2010-2012 period is 1.04% with the range of 20.46% to -12.65%. The Sri Lankan stock market experienced extreme return volatility during the period with a monthly standard deviation of returns of 7.1%. The average monthly inflation rate is 0.57% with a standard deviation of 0.79%. The average monthly industrial production growth is 0.88% with a standard deviation of 9.31%. The average broker credit growth rate is 1.72% with a high standard deviation of 30.14%. The maximum growth in credit occurred during February 2012, and the maximum decline in credit was in April 2011. The average monthly growth in trade volume is 9.35% with a standard deviation of 52.17%. The rolling 36-month market volatility is 0.64%.

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[3] Kaushalya and Dissabandara (2021) use the GARCH model to estimate the conditional market volatility. GARCH estimates are not used in the current study as the sample period is small and includes only 36 monthly observations.

Table 2

Descriptive Statistics of the Variables

	R_{t-1}	I_{t-1}	IP_{t-1}	BCG_{t-1}	δ^2_{t-1}	TV_{t-1}
Mean	1.04%	0.57%	0.88%	1.71%	0.63%	9.35%
Median	0.05%	0.61%	0.36%	-2.61%	0.61%	-2.660\%
Maximum	20.46%	2.18%	21.97%	146.66%	0.79%	192.66%
Minimum	-12.65%	-1.00%	-21.94%	-47.84%	0.48%	-65.34%
Std. Dev.	7.14%	0.79%	9.30%	30.14%	0.10%	52.17%

Note. I_{t-1} = Inflation, IP_{t-1} = Growth in Industrial Production Index, R_{t-1} = Stock Return, BCG_{t-1} =Growth in the ratio of Broker Credit to the ASPTRI, TV_{t-1} = Growth in trading volume, δ^2_{t-1} = 36-month rolling market volatility, R_{t-1}* TV_{t-1} = Stock Return*Trading Volume, R_{t-1}* BCG_{t-1} = Stock Return*Broker Credit Growth.

Table 3

Correlation Matrix

	R_{t-1}	I_{t-1}	IP_{t-1}	BCG_{t-1}	δ^2_{t-1}	TV_{t-1}
R_{t-1}	1.00					
I_{t-1}	-0.09	1.00				
IP_{t-1}	-0.28*	0.09	1.00			
BCG_{t-1}	-0.05	0.14	0.04	1.00		
δ^2_{t-1}	0.25*	0.04	0.04	-0.07	1.00	
TV_{t-1}	0.45*	0.02	-0.03	0.03	0.10	1.00

Note. I_{t-1} = Inflation, IP_{t-1} = Growth in Industrial Production Index, R_{t-1} = Stock Return, BCG_{t-1} =Growth in the ratio of Broker Credit to the ASPTRI, TV_{t-1} = Growth in trading volume, δ^2_{t-1} =36-month rolling market volatility, R_{t-1}* TV_{t-1} = Stock Return*Trading Volume, R_{t-1}* BCG_{t-1} = Stock Return*Broker Credit Growth. *Significant at 5%.

Overall, the correlations among variables range from low to moderate levels and do not signal a problem of multicollinearity. Stock returns show a positive correlation between market variance and trade volumes. Even though the correlations are not large, they are significant at the 5% significance level. Higher returns are associated with higher trading volume. The relation between growth in trading volume and growth in broker credit, and between growth in trading volume and volatility is also positive. The positive association of growth in broker credit and trading volume could be due to the increased investor participation in the stock

market. When the market is experiencing a growth in broker credit, it is likely that investors will actively participate and drive trade volumes up with the availability of more investible funds at their disposal.

5.2 Regression results

The probit regression results are presented in Table 4. In terms of macroeconomic factors, inflation is significantly positively associated with broker credit changes while growth in industrial production is significantly negatively associated with broker credit changes at the 5 percent of level of significance. This implies that the SEC is more likely to change broker credit directives in response to the inflationary pressures in the economy and less likely to change broker credit directives in response to expanding economic activities.

The results also indicate that the trading volume growth is negative and significant suggesting that the SEC is less likely to change broker credit when trading activity is high. Interestingly, as expected, the lagged stock market volatility is positive and significant at 5 percent providing clear evidence that higher market volatility leads to changes in broker credit directives. Thus, the SEC's actions seem to be reliably correlated with market volatility which is considered the main reason for tightening or relaxing broker credit regulations. Contrary to the expectations and evidence in prior studies, stock market returns and growth in broker credit volumes show no impact on the changes in broker credit directives.

Table 4

Probit Regression Results

		No. observations	36
		Porb> chi 2	0.00
		Pseudo R^2	0.60
Variable	Coefficient	Z	p-value
I_{t-1}	0.26*	2.06	0.04
IP_{t-1}	-0.01*	-2.01	0.04
R_{t-1}	0.01	1.48	0.14
BCG_{t-1}	0.00	1.04	0.29
TV_{t-1}	-0.00*	-2.08	0.03
δ^2_{t-1}	1.44*	1.97	0.04
$R_{t-1}*TV_{t-1}$	0.00	1.64	0.10
$R_{t-1}*BCG_{t-1}$	0.00*	2.28	0.02

Note. I_{t-1} = Inflation, IP_{t-1} = Growth in Industrial Production Index, R_{t-1} = Stock Return, BCG_{t-1} =Growth in the ratio of Broker Credit to the ASPTRI, TV_{t-1} = Growth in trading volume, δ^2_{t-1} =36-month rolling market volatility, $R_{t-1}*TV_{t-1}$ = Stock Return*Trading Volume, $R_{t-1}*BCG_{t-1}$ = Stock Return*Broker Credit Growth. *Significant at 5%.

Interestingly, the interaction of stock returns and broker credit growth is significantly positively related to broker credit changes. This implies that while stock returns and broker credit growth individually do not influence broker credit changes, when combined, they exert

an important influence. In other words, when the stock market rises coupled with higher growth of broker credit, the SEC is more likely to tighten broker credit availability to reduce speculative activity and market overheating. These results suggest that the SEC might not always consider changing broker credit directives in response to changes in the general economy unless they suspect possible destabilizing speculation manifested through rising stock prices and the increased use of leverage through broker credit by investors.

Consistent with the above results in the Sri Lankan stock market, Chen (2016) indicates that large fluctuations in prices can be attributed to the abuse of leverage by investors. Galbraith (1975) also attributes the underlying cause of the South Sea Bubble to the use of unlimited leverage by the investors. Hence, the abuse of leverage by investors can cause large fluctuations in stock prices and lead to destabilizing markets. Guo et al. (2011) also conclude that credit-based trading activities enhance investor speculation and result in high market volatility. Guo et al. (2010) argue that speculation based on the abuse of leverage by investors creates stock price pyramiding and de-pyramiding effects. The excess speculative volatility can be reduced by controlling investors' leverage or credit availability and thereby restraining their trading activities. Our empirical evidence suggests that the SEC had identified such speculative conditions and responded to curb such activity by tightening credit availability to investors in the stock market.

6. Summary and conclusions

The effectiveness of the regulatory changes in credit directives depends on its responsiveness to the underlying factors that cause excess market volatility. The current study examines the impact of macroeconomic and market factors on regulatory decisions to change stockbroker credit directives in the Sri Lankan stock market.

Using the probit regressions during a period of high market volatility, we find interesting results relating to the impact of macroeconomic and market factors on changes in broker credit regulations. Inflation is significantly positively associated with broker credit changes while industrial production growth is significantly negatively associated with broker credit changes. These results suggest that the SEC is more likely to change broker credit directives in response to inflationary pressures in the economy and less likely to change them in response to expanding economic activities.

We also find that trading volume growth has a negative and significant impact on change in broker credit directives, suggesting that the SEC is less likely to change broker credit when trading activity is high. The results show that stock market volatility has a reliably positive effect indicating that higher market volatility leads to changes in broker credit directives. This confirms that SEC's actions are reliably correlated with market volatility which is one of the key reasons for tightening or relaxing broker credit regulations.

Sock market returns and growth in broker credit volumes have no impact on changes in broker credit directives. However, the interaction of stock return and broker credit growth is significantly positively related to broker credit changes. This provides clear evidence that although stock returns and broker credit growth do not impact broker credit changes individually, they have an important effect when combined. This means that the SEC is more compelled to change credit directives when the stock market experiences speculative investor behavior. More specifically, the results indicate that when the market experiences a simultaneous increase in stock return the credit growth, SEC is more likely to respond through

changes in credit directives to constrain speculative activities that cause excess market volatility.

Even though the results show that macroeconomic factors are likely to affect the regulatory responses, policy decisions will reap full benefit only if these factors lead to a possible investor destabilizing speculation in the market. Hence, to get the expected outcome of credit directive changes, it is vital to identify the conditions that lead to market speculation through the use of personal leverage by investors. Therefore, the SEC needs to pay more attention to the same factors that they respond through these policy tools and ensure it addresses the exact market conditions. Otherwise, policy decisions may lead to a deterioration of the market.

The results of this study will be helpful especially for the retail investors who trade based on market credit facilities. Investors can expect more changes in broker credit regulations at times of excessive volatility, growth in trade volume, and suspected speculative activities. Having a better understanding of these factors will enable investors to make proactive investment decisions. For instance, if the SEC is more likely to restrict the credit availability to investors, existing investors can adjust their portfolios by reducing the credit exposure or liquidating profitable holdings with the expectation of changes in credit availability in the future. On the other hand, if they do not take proactive actions, brokers will force-sell the most liquid assets that might not be the most profitable to the investor and comply with the new credit rules.

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