The Nexus between Buyback, Business Cycle, and Stock Market Volatility

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Abstract Financial crisis shows significant uncertainties in corporate financing conditions. This study draws on economic conditions toask if buyback programs are related to the business cycle and the stock market volatility. The results show both unidirectional and bidirectional causality between buyback, business cycle and stock market volatility. It also shows that financial crisis plays an important role, suggesting that firms increase their buyback depending on their economic condition.

Keywords: stock repurchases business cycle, stock market volatility, nonlinear causality, granger causality

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1. Introduction

Buyback remains one of the most controversial decisionsin the company. This decision is important because it determines what funds flow to investors and what funds are retained to the firm. The decision to repurchase provides information about future firm performance, according to the signal sent to the market [1]. For example, according to [2], empirical and theoretical models developed in the literature show that firms repurchase either in terms of signaling [3] or the free cash flow hypothesis [4].

Following the stock market crash (October 1987 and 2007) firms knew an important decision to buyback stocks. For instance, between 1984 and 2000 firms spent approximately 26 % of their entire annual earnings on stock repurchase [5]. On September 11th, 329 firms made buyback announcements one week following the attack day compared to 565 firms during all of 2001 prior to September 12 [6]. Aggregate data from Thomson Financial also show similar behavior in many countries (firms which made up S&P500 index in 2003 bought back $284 billion of their own shares, and reached $973 billion in 2006). The increase in the buyback was directly related to periods of high volatility in the financial market. As noted by [7] "Given the uncertainty about the motivation for repurchases, the stock market crash of 1987 provides a unique opportunity to study repurchase announcement".

Previous works establish a relationship between stock market volatility and macroeconomic fundamentals. All results show a significant effect of economic conditions on the level of the stock return.[1] In this context, empirical studies have focused on whether stock market volatility, which exhibits a different behavior over expansion and recession periods, can be predicted by various macroeconomic variables [8,9].

In this paper, we combine buy back, business cycles, and stock market volatility to examine the nature of this relationship. We hypothesize that market and economic factors can trigger firms to buy back according to the significant level of buybacks during major financial crisis. This issue remains largely unstudied since the literature generally places more weight on measuring, modeling or explaining repurchase with the signaling or the free cash flow hypothesis, rather than exploring its links with the business cycle and economic condition. We, therefore, provide further evidence on buyback according to the economic condition [10,11,12,13,14].

Our methodology relies on Granger causality where buyback, business cycle, and stock market volatility are considered as endogenous variables. We reconcile past explanations by supposing that firms attempt to repurchase shares depending on stock market volatility and business cycle and vice versa. Specifically, we extend the recent research [10,11,12,13,14] by investigating the relationship between business cycle stock market volatility and stock repurchase. In fact, we propose an explanation that reconciles the two conflicting free cash flow and the signaling hypotheses. We argue that firms repurchase shares in accordance with the economic condition and growth levels. We attempt to bridge these gaps by investigating the causal links between repurchase programs, business cycle and stock market volatility in each of Canada, Japan, UK, and the US.

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[1] See [9,22,23], among others.

Our analysis reveals a bidirectional Granger causality effect between buyback and business cycle during 1998-2016 and to a certain extent in the 2007-2008 crisis periods. This finding is consistent with the view that the financial crisis increased the cost of external financing and hence some firms turned to increase payout in the form of buyback. It fit well with the idea that the financial flexibility in repurchase during the financial crisis is important when investment opportunities are rare. However, the results are less convincing for stock market volatility and in a multivariate setting, they are different between countries. We confirm causality between the business cycle and buyback in Japan and US and stock market volatility and buyback in Canada and the US. Our results, however, are less favorable in the UK.

2. Theoretical Framework

An easy way to comply with the journal paper formatting requirements is to use this document as a template and simply type your text into it.

[15] Show that it is statistically impossible to distinguish the long-run total payout growth rates from the macroeconomic growth rate. The authors find that the total pay outs grow in line with the real economy. [16] Show that earnings per share growth for US stocks is in line with US GDP per capita. The theory developed by [2] argues that buyback programs would be used when there are unexpected increases in free cash flow, and that a positive economic shock should therefore correspond to a share repurchase increase. It is suggested that repurchases have given to financial managers more freedom to pay cash dividends on more stable terms and to repurchase in unstable conditions. In other words, when the economy is running below capacity, firms may distribute differently their cash flows to residual claimants comparing to a higher or booming state [17]. In a booming economy however, firms experience abnormal increases in excess cash flow. This lead companies to initiate buyback as opposed to dividends in distributing their excess cash flows, as increasing dividends may indicate to the market that higher levels of cash flows can be sustained. The causality between repurchase and economic growth has been largely ignored in practice. Many practitioners continue to rely on traditional models using dividends as unique source of payment for corporate payout. In this paper, we reconcile previous conclusions by assuming that share buyback depend on the business cycle and economic development in each country. In fact, if buyback occur, we predict a shortfall in the economic conditions. Such empirical exercise had not yet been conducted and remains a largely unexplored. Specifically, the study gives explanation to some recent research [10,11,12,13,14] by exploring the relationship between business cycle, economic growth and buyback programs. This explanation will reconcile the two conflicting free cash flow and the signaling hypotheses. We argue that firms repurchase shares in accordance to economic condition and growth levels and hence we predict more buyback in financial crisis. We test this causality in each of Canada, Japan, UK and US. The study reveals a sharp bidirectional causality between buyback and business cycle during the 1998-2016 and to a certain

extent in 2007-2008 financial crisis. These findings confirm that the financial crisis increases the cost of external financing. And as a consequence, a number of firms tend to increase payout in the form of buyback. They align with these observations, as we assume that financial flexibility in buyback during the financial crisis is important when investment opportunities are rare.

3. Data and Methodology

3.1. Sample Construction

We employ quarterly data from four major economies, namely Canada, Japan, the UK, and the US. Our dataset is derived from the Thomson Financial Data Stream and covers 1998 Q1 to 2019 Q4. We have chosen to study a long period of 10 years before and after the 2007 crisis. Our analysis relies on the accurate measurement of buybacks. The proxy is computed from the quarterly dollar value of the "Purchases of Common and Preferred Stock" from the World scope Cash flow statement. It is the funds used to decrease the outstanding shares of common and/or preferred stock. (Including Purchase of treasury shares, Repurchase of stock, Conversion of preferred stock into common stock, Retirement of preferred stock and Exchange of common stock for debentures). We compute the number of shares repurchased assuming that the shares were purchased at either the (1) the average monthly closing price during the quarter or (2) the lowest price during the quarter. Because stock repurchase is scarce we collect all buybacks made by all firms in the corresponding country and we do not differentiate between different forms of repurchase.

We employ the logarithm of continuously compounded quarterly stock returns of S&P/TSX composite index (Canada), the TOPIX Index (Japan)[2], the FTSE-All Share (UK) and the S&P 500 (US) to measure stock market volatility and the total industrial production growth rate on a quarterly base to represent the business cycle. This data is derived from the OECD dataset.

Industrial production IP(t) denotes the rate of industrial production in quarter t, the quarterly rate is computed as: $IPR(t) = \ln IP(t) - \ln IP(t-1)$ and market volatility is computed with the ARCH and GARCH(1,1) model. The continuously compounded monthly stock returns are computed as follows: $R_t = \ln(P_t/P_{t-1})$ where P_t and R_t denote the stock index prices at time t and t-1. Also, buyback is the quarterly rate of deseasonalized repurchase data.

3.2. Descriptive Statistics

To illustrate changes in stock index, Figure 1 plots the time-series of four indexes from 1998 to 2019. Consistent with the onset of the financial crisis in late 2007, all indices show a fall from 2007 to 2009. The data in Figure 1 also illustrate that indices are moving in the same direction.

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[2]This is a measure of the overall trend in the Tokyo stock market, and it is used as a benchmark for investment in japan stocks. It contains 2000 companies composed of TOPIX Core30, TOPIX Large70, TOPIX Mid400, TOPIX Small 1 and TOPIX Small 2.
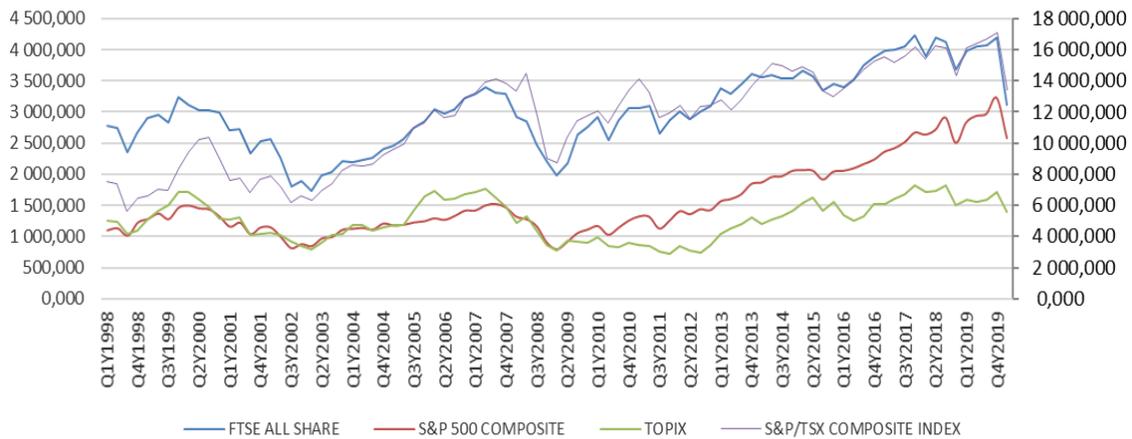
Figure 1. Stock market index growth between1998-2019

Table 1 describe empirical statistics of several financial assets and actual buyback in US, Canada, Japan and UK. According to figures, the number of shares repurchased is similar for the two measures of repurchase. The average number of shares repurchases significantly higher in US. However, in Japan there is a significant disparity in the number of shares repurchased. This statistical measure shows that buyback programs are not commonly used by firms in Japan. Observing the minimum and maximum values confirms this result and indicates that throughout the reporting period the buyback program can be used massively under certain circumstances. The statistical Skewness also shows that buyback distribution is skewed to the right for all countries. In other words, there are a number of firms that buy back exceptionally in specific periods and accordingly firms buy back their shares only in financial crisis period. Data on the buyback programs represent an extreme value. Kurtosis's statistic also validates this result and shows that the buyback distribution is not normal. We conclude that the use of the buyback program in the United States is very different from other countries. In the U.S. and Canada, buybacks are much more widely used.

3.2. The VAR Model

To test the linear causal links between business cycle, stock market volatility and stock repurchase, we use the Granger and Sims causality tests witch assume that the time series involved in the analysis are stationary [18,25]. As outlined earlier, we follow the conventional approach by exploring first the stationarity of the variables. If they are a stationary process, the Granger causality test is carried on variables in levels. If not, integrated variables are used. In all cases, causality tests are based on the following tri-variate vector autoregressive VAR model in the spirit developed by [19,20]:

$$
\begin{bmatrix} SMV_{it} \\ BC_{it} \\ REP_{it} \end{bmatrix} = \begin{bmatrix} \delta_{1\mathbf{j}} \\ \delta_{2\mathbf{j}} \\ \delta_{3\mathbf{j}} \end{bmatrix}
$$
$$
+ \sum_{k=1}^{q} \begin{bmatrix} \alpha_{11ik} & \beta_{12ik} & \gamma_{13ik} \\ \alpha_{21ik} & \beta_{22ik} & \gamma_{23ik} \\ \alpha_{31ik} & \beta_{32ik} & \gamma_{33ik} \end{bmatrix} \begin{bmatrix} SMV_{it-\mathbf{k}} \\ BC_{it-k} \\ REP_{it-k} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1it} \\ \varepsilon_{2it} \\ \varepsilon_{3it} \end{bmatrix}. \tag{1}
$$

Where SMV is the stock market volatility, BC is the business cycle indicator and REP is the shares repurchase. n is the optimal lag length based on the Akaike information criterion (AIC). All variables are in log and the ε_t are the terms of the residual supposed to be white noise. The estimated coefficients α_i, β_i γ_i represent the linear relationship between dependent and independent variables and the ε_i will be used later to test the nonlinear relationship in the dependent variables.

Table 1. Descriptive statistics of several financial assets: FTSE ALL SHARE, S&P 500 COMPOSITE, TOPIX and S&P/TSX COMPOSITE INDEX

Panel 1							
Asset		Mean	Std.dev.	Skewness	Kurtosis	Min	Max
FTSE ALL SHARE		1 889,40	1 264,63	0,09	-1,32	66,90	4 221,82
S&P 500 COMPOSITE		897,77	774,83	0,92	0,14	63,54	3 230,78
TOPIX		1 196,69	543,69	0,24	-0,20	278,71	2 881,37
S&P/TSX COMPOSITE INDEX		7 054,16	4 975,39	0,45	-1,25	855,78	17 063,43
Stock repurchase statistics							
Panel 2							
UK	Min	15884	42964	3,485	11,964	0	222494
	Ave	15803	42783	3,49	11,99	0	221666
US	Min	140263	91757	0,80	-0,05	19175	404391
	Ave	139381	91135	0,79	-0,07	19030	399752
Japan	Min	51272	1110738	2,42	5,04	0	4715455
	Ave	51007	1105296	2,42	5,05	0	4697459
Canada	Min	892	923	1,34	0,94	26	3858
	Ave	887	918	1,35	0,95	25,97	3832,67

The Granger causality test assumes that the information relevant to the prediction of the respective variables is contained solely in the time series data on these variables. Therefore, the causalities between each of the three variables *REP, BC and SMV* may unidirectional or bi-directional. Drawing on this, we test the following null hypothesis:

(REP, SMV) H_{01}: α_{31ik}=0 for all i = 1,….n and H_{02}: γ_{13ik} = 0 for all i : 1,…..,n .

(REP, BC) H_{03}: β_{32ik} =0 for all i = 1,….n and H_{04}: γ_{23ik} = 0 for all i : 1,…..,n

(BC, SMV) H_{05}: β_{12ik}=0 for all i = 1,….n and H_{06}: α_{13ik} = 0 for all i : 1,…..,n.

4. Empirical Results

Our methodology produces a total of 4 VARs estimated for each of Canada, UK and US and of 3 VARs for Japan. The results of the causality tests are reported in Table 2 and indicate that the distinction made between pre and post-financial crisis does matter. Whereas we found a causality running between business cycle and stock market volatility for US, Canada, Japan, there is no

relationship in UK before 2007. On the other hand, it seems that only in US economy we expect a real causality between stock market volatility, business cycle and stock repurchase. The test indicates a significant effect at 99% confidence level and for the two proxy of buyback measures. Perhaps, the most interesting aspect of this result is that, in the US, buyback programs are frequently used compared to other countries. According to [21,24], firms in the United States can easily buy back shares because the legislation do not prohibit them to repurchase.

For the full sample period, the results are mixed. In Canada for examples tock repurchase Granger-cause stock market volatility and in Japan the causality is bi-directional with the business cycle. However, A different picture arises with no significant causalities in UK and US. Our results suggest that within a multivariate setting the repurchase programs are an important explanatory variable with feedback to stock market volatility and the business cycle.

This finding indicates that the effect of repurchase is absorbed after 2007 financial crisis in US and UK. Perhaps in these countries, the negative impact of financial crisis on business cycle and stock market volatility is less pronounced.

Table 2. Multivariate Granger linear causality between business cycle, Stock repurchase, and stock market volatility

		Hypothesis	Canada				Japan			
			χ^2-stat		causality		χ^2-stat		causality	
Panel I: Pre-crisis period (1998:01-2007:4)			REP_{min}	REP_{ave}	REP_{min}	REP_{ave}	REP_{min}	REP_{ave}	REP_{min}	REP_{ave}
country	**Lags**	**H$_{01}$**	10.82**	4.02		.875	Na		2.769	.366
Canada	4-4	**H$_{02}$**	16.23***	5.054		1.616	Na		.950	.114
Japan	2-1	**H$_{03}$**	6.07	9.802*5.93		.226	Na		14.15**	.033
UK	5-1	**H$_{04}$**	9.329*	3.103		1.497	Na		2.953	.236
US	5-8	**H$_{05}$**	27.33***	28.45***	BC⇄SMV		5.93*	3.95**	BC⇄SMV	
		H$_{06}$		16.94***	9.693**		6.09**	4.98**		
Panel II: Full sample period (1998:01-2019:04)										
country	**Lags**	**H$_{01}$**	2.476	5.3144			2.947	27.58***		
Canada	4-4	**H$_{02}$**	39.81***	8.450*	REP→SMV		3.974	17.27***		
Japan	2-6	**H$_{03}$**	2.176	7.551			6.106**	26.961***	REP⇄BC	
UK	1-1	**H$_{04}$**	12.15*	3.482			1.991	30.61***		
US	1-1	**H$_{05}$**	7.458	4.8133		12.00***	17.273***		BC⇄SMV	
		H$_{06}$	8.729*	17.90***	SMV→BC		1.136	42.08***		
		Hypothesis	UK				US			
			χ^2-stat		causality		χ^2-stat		causality	
Panel I: Pre-crisis period (1998:01-2007:4)			REP_{min}	REP_{ave}	REP_{min}	REP_{ave}	REP_{min}	REP_{ave}	REP_{min}	REP_{ave}
country	**Lags**	**H$_{01}$**	19.55***	332***						
Canada	4-4	**H$_{02}$**	25.85***	955.1***					REP⇄SMV	
Japan	2-1	**H$_{03}$**	27.59***	380.1***						
UK	5-1	**H$_{04}$**	9.59*	723.05***					REP⇄BC	
US	5-8	**H$_{05}$**	3.047	.052			25.738***	1488***	BC⇄SMV	
		H$_{06}$	9.154	.089			6.760	960.4***		
Panel II: Full sample period (1998:01-2019:04)										
country	**Lags**	**H$_{01}$**	1.265	0.191			2.13	0.010		
Canada	4-4	**H$_{02}$**	0.027	0.826			7.48**	0.487		
Japan	2-6	**H$_{03}$**	0.012	0.455			.623	2.02		
UK	1-1	**H$_{04}$**	3.874**	0.047			2.062	0.200		
US	1-1	**H$_{05}$**	3.07*	5.339**	BC →SMV		9.836***	11.19***	BC⇄SMV	
		H$_{06}$	0.048	0.086			6.535**	11.43***		

This table presents the causality test between stock repurchase, business cycle and stock market volatility. H01: stock market volatility does not Granger cause repurchase. H02: repurchase does not Granger cause stock market volatility .H03: a Business cycle does not Granger cause repurchase. H04: repurchase does not Granger cause Business cycle.H05:a Business cycle does not Granger cause stock market volatility. H06: stock market volatility does not Granger cause Business cycle. Lags: is the optimal number of lags for the model using REPmin and REPaveNa: None Available data because no repurchase has been recorded.

→ one-way causality; ⇄ : two-way causality

* Significant at the 10% level. ** Significant at the 5% level. ***Significant at the 1% level.

5. Conclusion

In this paper, we examine the impact of potential causality between buyback programs, business cycle and stock market volatility. Accordingly, we use the Granger causality testand we considered two measures of repurchases and considered the possibility of two sub-periods to take into account the effect of the financial crisis. Our tests within a linear bivariate setting offer strong evidence of bidirectional causality between the business cycle and stock repurchase over 1998-2019 in all countries. The results are robust to the inclusion of the financial crisis of 2007. Indeed, we found that buy back programs we are not independent from business cycle and stock market volatility. This result underline the pertinence of the case by case approach in the designing of policies related to corporate distribution mainly in more developed countries.

The multivariate framework reveals a significant causality in most cases suggesting that the dynamics between the considered variables are important. While a causal link is present between the business cycle and stock market volatility in all countries, only in the US the feedback is present between buyback, business cycle and stock market volatility before 2007. This evidence answers the question of why repurchases occur in waves, particularly in the US. Though we do not find the same result in other countries, our results suggest two possible responses that will hopefully stimulate future research. First, it is feasible that, buybacks, are not driven by mis-valuation, but occur according to the differing responses to the business cycles and to a less extent stock market volatility, such that all firms may not peak at the same time and some may be financing investment opportunities at the peak of the business cycles while others have realized cash flows and have fewer investment opportunities and therefore have surplus cash [11]. Second, given that economic growth yields varying degrees of uncertainty and therefore increasing the need for flexibility, buyback will be an important motive in uncertain periods.

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