Time series analyses of stock market and consumer confidence indices:

A Granger causality test

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I. Introduction

The persistently low market confidence, including consumer and business confidence, since the 2008 US subprime crisis has attracted a lot of attention from both policymakers and economists, and has led to great concern about the impact of market pessimism on the economy (Shiu-Sheng Chen 2011). Measures of consumer and business confidence have been documented to have important predictive power for consumer expenditure (Ludvigson 2004, Slacalek 2004, and Souleles 2001) and industrial production (Grisse 2009) respectively. Recently, another causal link has been proposed: rising (declining) stock markets may make consumers and businesses feel better (worse) about the future, and therefore induce them to spend and/or invest more (less) (Jansen and Nahuis 2003). As a result, many recent studies have started to look into the causal relationship between stock returns and consumer and business confidence, more specifically the Consumer Confidence Index (CCI) and the Business Confidence Index (BCI), seeking to establish a linkage between the stock market and the economic output via the market confidence channel (Jansen and Nahuis 2003). On the other hand, because consumer and business confidence do have an important role in the real economic activity, it is reasonable to expect the reverse direction that consumer and business confidence may have an impact on the stock market[1]. As a result, the existing literature on the causal direction between stock returns and consumer and business confidence is mixed.

Focusing on the US and the European stock markets, the majority of works in this

[1] Consumer confidence affects consumer spending, thus influence expected corporate profits (Bremmer 2008). The publication of consumer survey data can have an "animal spirits" effect on the stock market, inducing investors to sell stocks when they fear the economy will exacerbate (Shiu-Sheng Chen 2011, Jansen and Nahuis 2003, Chih-Shiang Hsu et al. 2011).

domain concluded that stock returns Granger-affect consumer and business confidence but not vice versa (see Otoo 1999, Jansen and Nahuis 2003, Bremmer 2008, and Collins 2001), while a few others found that for some countries, consumer and business confidence is actually a significant predictor of expected stock returns even though its predictive power varies across countries (see Maik Schmeling 2009, Atukeren, Korkmaz, and Çevik 2012). These results imply that the relationship between stock returns and consumer and business confidence may have its own idiosyncratic properties in each country.

The existing literature has primarily focused on the US and the European stock markets with only modest attention to Asian stock markets. Additionally, previous studies have primarily focused on the connection between stock returns and consumer confidence; however, very few have discussed the relationship between stock returns and business confidence. Particularly, no previous research has compared the two and their connections with stock returns. Therefore, this paper will add to the current literature by investigating the causal relationship between stock returns and the CCI and the BCI in several American, European, and Asian stock markets in order to provide a more global perspective on this topic. Moreover, this paper also aims to compare the stock returns - consumer confidence relation and the stock returns - business confidence relation.

Following the methodologies proposed by Otoo (1999), Jansen and Nahuis (2003), and Bremmer (2008), we used the vector autoregression (VAR) approach and conducted Granger-causality testing to investigate the possible causality between stock returns, measured as the first difference of the logarithm of stock prices, and the CCI and the BCI. First, we transformed the country's stock price index (stock prices) into their natural logarithms. Second, we conducted unit root tests for the logarithm of stock prices, the CCI, and the BCI. Unit root testing indicated the need to difference all variables to meet the stationarity condition; therefore, we calculated the first difference of the logarithm of stock prices, the CCI, and the BCI. We then used the first-differenced data for all subsequent analysis. The first difference of the logarithm of stock prices is approximately stock returns. Third, we estimated two two-equation vector autoregression (VAR) models for the CCI analysis and the BCI analysis respectively. Fourth, we conducted Granger-causality tests for the two estimated VAR models and made inferences regarding the Granger-causality direction between stock returns and the CCI and the BCI correspondingly.

For our analysis, we obtained monthly stock price indices from the MSCI Global Equity Indices database[2], monthly CCI from the Organization for Economic Co-operation and Development (OECD) Consumer Opinion Surveys database, and monthly BCI from the OECD Business Tendency Surveys database[3]. The CCI analysis used data from April 2001 to September 2013, and the BCI analysis used data from April 1995 to September 2013.

The rest of this paper is organized as follows: Section II provides an overview of past literature on the subject. Section III describes the theoretical framework and the economic theory behind our hypothesis. Section IV describes the data and the methodology used in this study. Section V presents the results. Section VI discusses the differences across countries in effects of stock returns on consumer and business confidence (and vice versa). Section VII concludes the study.

II. Review of literature

[2] Accessed at: http://www.msci.com/products/indices/performance.html

[3] Accessed at: http://stats.oecd.org/

There have been various studies focusing on the possible causality between the stock market and measures of the real economic activity such as money supply and GDP (Ahmed and Imam 2007), industrial production output and foreign exchange rates (Mahmood and Diniah 2009), and economic growth (Antonios 2010, and Antonios and Athanasios 2013). According to Jansen and Nahuis (2003), the theoretical literature identifies three well-known causal links between the stock market and the real economy: consumption via the conventional wealth effect (Poterba 2000), investment via the Tobin's Q theory (Barnett and Sakellaris 1998), and credit market imperfections plus their consequences for expenditures via the balance sheet channel (Bernanke, Gertler and Gilchrist 1998). Recently, another causal link has been proposed: rising (declining) stock markets may make consumers and businesses feel better (worse) about the future, and therefore induce them to spend and/or invest more (less) (Jansen and Nahuis 2003). Measures of consumer and business confidence have been documented to have important predictive power for consumer expenditure (Ludvigson 2004, Slacalek 2004, and Souleles 2001) and industrial production (Grisse 2009) respectively. This paper aims to examine the first half of the causal link: the relationship between the stock market and the measures of consumer and business confidence.

Two proxies used to measure the consumers' sentiment and the businesses' sentiment are the Consumer Confidence Index (hereafter CCI) and the Business Confidence Index (hereafter BCI) respectively. For most countries, there are usually only one official CCI and one official BCI collected by a government or private agency and released at the end of each month.

Two popular proxies used to measure the stock market performance are the stock price index (stock prices) and the return of the stock price index (stock returns). A stock price or a stock return generally captures the performance of a given stock and is usually calculated on a daily basis; therefore, to measure the performance of an entire given stock market, the stock price index of that market or the return of the stock price index of that market is usually utilized. Each stock price index is usually calculated by summing the free float-adjusted market capitalization-weighted prices of all its constituents on a given day and not accounting for the value of their dividends. As a result, the stock price index only best measures the stock market price performance and not the income from dividend payments (About MSCI Total Return Indices 2010). The more comprehensive way to calculate the return of a stock price index is by summing not only the free float-adjusted market capitalization-weighted capital gains of all underlying securities in the index but also the value of their dividends. This way, stock returns can better measure the whole stock market performance, including price performance and income from dividend payments (About MSCI Total Return Indices 2010). However, the information regarding dividend payments is not always available; therefore, ways to account for the value of dividends and how dividends are reinvested also vary from one methodology to another. The more simple way to calculate the return of a stock price index is by calculating the "rates of change" of the index without paying too much attention to dividend payments. There are two main formulas used to calculate the "rates of change" of a time series, which are also the stock returns in this case:

The simple return formula: $r_t = (X_t - X_{t-1})/X_{t-1}$

The log return formula: $r_t = \log(X_t/X_{t-1}) = \log(X_t) - \log(X_{t-1}) = \Delta\log(X_t)$ = the first difference of the logarithm of stock prices

As a result, even though stock prices do not fluctuate at a constant level, stock returns do, which is an important condition to perform further time series analysis; therefore, stock returns are usually used instead of stock prices to investigate the relationship between the stock market performance and the market confidence indices (the CCI and the BCI). Unsurprisingly, previous studies in this area have primarily focused on the relationship between stock returns and the CCI and the BCI. Some previous studies used the simple return formula to calculate stock returns before doing the analysis (see Fisher and Statman 2002, Maik Schmeling 2009, and Collins 2001), while the majority of previous studies used the log return formula to calculate stock returns (see Otoo 1999, Jansen and Nahuis 2003, Bremmer 2008, Karnizova and Khan 2010, Shiu-Sheng Chen 2011, and Atukeren, Korkmaz, and Çevik 2012). The literature on the relationship between stock returns and the CCI is quite rich compared to that on the BCI.

The CCI generally aims to measure the consumer tendencies and expectations for the general economic and business situation, future job opportunities and income, and the propensity to purchase.

The existing literature regarding the connection between stock returns and the CCI varies[4]. Otoo (1999) used data from the University of Michigan Consumer Sentiment Index (UMCSI) and the Wilshire 5000 Index to argue that the direction of the influence in the US runs from stock returns (the first difference of the logarithm of stock prices) to the

[4] See Appendix E for a summary of previous studies' results and a comparison with this paper's results

UMCSI but not vice versa. Jansen and Nahuis (2003) extended Otoo's analysis (1999) to eleven European countries[5] and found that stock returns and the CCI are positively correlated for nine countries, with Germany as the main exception. According to their research, stock returns generally Granger-cause the CCI at very short horizons (two weeks to one month), but not vice versa. Applying Granger-causality tests for nine different US stock price indices and the UMCSI, Bremmer (2008) also found that stock returns Granger-affect the CCI but not vice versa. Bremmer (2008) also found that while there is no relation between expected changes in consumer confidence and stock returns, unexpected changes in consumer confidence have direct effects on stock returns. This finding supports what we theoretically conclude about the efficient market literature: predictions of expected changes in consumer confidence based on commonly available data should have no effect on stock returns because equity prices had already embodied this common information, and stock returns already reflect it. However, if the changes in consumer confidence were unexpected, they would affect stock returns in a proportional direction. Karnizova and Khan (2010) studied the Canadian stock market and found evidence of asymmetric effects of stock returns on the CCI. They found that stock returns generally Granger-cause the CCI, and the negative estimated coefficient is more than twice as large as the positive coefficient, indicating asymmetric effects of stock returns on confidence. Their findings imply that the consumer confidence channel might have amplified the effects of stock returns on the aggregate consumption in Canada, especially during periods of negative changes observed since the global financial crisis from 2007 to 2008. According to Shiu-Sheng Chen (2011), assuming causality runs from the UMCSI to S&P 500 returns rather

[5] Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain and the UK.

than the reverse, the lack of consumer confidence in fact has an asymmetric effect on stock returns. The impact is greater in bear markets: a greater market pessimism leads the market to stay in a bear period for longer, a greater lack of consumer confidence indeed pushes the stock market into bear period, and the greater the market pessimism the higher the probability of switching from a bull to a bear market. Although their nonlinear models deliver strong and interesting results, they made an assumption regarding the direction of causality; and therefore, the direction of causality is not conclusive in their study.

On the other hand, there are also several studies supporting the reverse causal direction that the CCI Granger-affects stock returns. Maik Schmeling (2009) found that consumer confidence is a significant predictor of expected stock returns across 18 industrialized countries[6]. However, the predictive power of consumer confidence varies across countries, and for some countries, in their individual country regressions, consumer confidence does not contain predictive power at all. According to Chui, Titman and Wei (2009), the impact of consumer confidence on stock returns is higher for countries that are culturally more prone to herd-like investment behaviors and for countries that have less efficient regulatory institutions or less market integrity, implying that the stock returns and consumer confidence relation can differ across countries. Moreover, focusing on the US stock market, Fisher and Statman (2002) also found that the CCI can actually predict some even though not all stock returns. In particular, there is a negative statistically significant relationship between the Conference Board Consumer Confidence Index and the Nasdaq and the small-cap stock returns; however, the Conference Board Consumer Confidence

[6] The US, Japan, Australia, New Zealand and 14 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom.

Index is not a reliable predictor of the S&P 500 stock returns. Therefore, one cannot mechanically transfer evidence from the US to other stock markets. Instead, institutional quality and cultural factors are strong determinants of the stock returns - consumer confidence relation.

The BCI generally aims to reflect the executives' judgments on recent past developments, the current situation, and the prospects for the next few months of their enterprises. The BCI survey usually asks about production (present and future), orders inflow, order books, inventories, and capacity utilization. The BCI are sometimes divided into different sectors: manufacturing, construction, retail trade, services, and non-manufacturing. The relationship between stock returns and the BCI, however, has received very modest attention in the literature[7]. Collins (2001) used the monthly and quarterly percentage change of the benchmark equity indices, which is quite similar to the simple return formula calculation, as proxy to measure the stock market performance. He shows that the BCI is not a predictor of stock returns, but stock returns are predictors of the BCI in four countries: USA, Germany, Japan, and South Africa. Atukeren, Korkmaz, and Çevik (2012) found that the relationship between stock returns and the BCI is bidirectional in Portugal, while it runs from the BCI to stock returns in Italy and in the reverse direction in Spain. These results indicate that the stock returns - business confidence relation has its own idiosyncratic properties in each country and there is no one conclusive causal direction.

Even though very few studies focused on the relationship between stock returns

[7] See Appendix F for a summary of previous studies' results and a comparison with this paper's results

and business confidence, the capability of the BCI to explain and anticipate the behavior of firms has been widely agreed upon (Altissimo et al. 2001, Baffigi and Bassanetti 2004, Carnazza and Parigi 2001). Empirical findings show that the BCI is correlated with industrial production (Grisse 2009, and Bastião 2010). Moreover, previous studies also suggest that industrial production has a very significant role in explaining stock market movements. More specifically, industrial production was found to be significant in explaining stock returns (Chen, Roll and Ross 1986, Fama 1990, Bilson, Brailsford and Hooper 2001, Binswanger 2004, Lucey, Nejadmalayeri and Singh 2008). Therefore, one can expect that the BCI can have a significant role in explaining stock returns as well.

Our paper will reinvestigate the relationship between stock returns, measured as the first difference of the logarithm of stock prices[8], and the two market confidence indices (the CCI and the BCI) in several American, European, and Asian stock markets in order to provide a more global perspective on this topic. Existing literature has focused on the US and the European stock markets with modest attention to Asian stock markets; therefore, the comparison between Western stock markets and Asian stock markets in this study can provide more in-depth information on the topic and better empirical evidence for further global implications. Moreover, since very little research has focused on the relationship between stock returns and the BCI, our study will add to the current literature by comparing the stock returns - consumer confidence relation and the stock returns - business confidence relation.

III. Theoretical framework

[8] According to the log return formula

Financial market participants can be roughly categorized as households and businesses. Households in the market are both consumers and investors. Consumers influence stock prices by purchasing goods and services from publicly traded companies, which consequently affect their sales and earnings. Moreover, since brokerage services and online investing are becoming more accessible, many consumers are now involved in direct trading besides participating via mutual funds and 401Ks, thus also become individual investors. As a result, households, consisting of consumers and investors, have been increasingly exposed to, and influencing, the stock market in recent years (Guzman 2007). Businesses are also important market participants. They are the listed companies themselves, or the suppliers, customers, and strategic partners of the listed companies; therefore, their economic situations determine the general economic growth as well as the discount rates used in asset valuation. As a result, nowadays, the stock market strongly brings together households and businesses, implying that their perceptions, sentiments, and expectations might contain predictive power for the financial markets (Guzman 2007).

Movements in the stock market are believed to influence consumer confidence through two separate channels. The first channel is the traditional wealth-effect where the stock market's movements cause changes in households' current wealth, which then influences consumer confidence. The second channel is the "leading indicator" channel, in which consumers interpret the stock market's movements as reliable indicators of future income changes and thus modify their consumption (Poterba and Samwick 1995, Morck, Shleifer and Vishny 1990). Explanations of possible causal relationships between consumer confidence and the stock market in the other direction are also theoretically reasonable. The first channel of influence is the link between consumer spending and corporate profits. There is empirical evidence that consumer confidence influences consumer spending. If this is valid, there could be a link between consumer confidence and expected corporate profits, inferring an indirect relationship between consumer confidence and the stock market (Bremmer 2008). The second potential channel is the "publication effect" (Jansen and Nahuis 2003), in which the publication of consumer survey data applies a psychological effect on the stock market. The this is the so-called “animal spirits” channel: when investors fear that the economy will exacerbate, they become afraid that the stock market will fall and they will lose money. As a result, they sell their stocks quickly, which may cause the market to collapse (Shiu-Sheng Chen 2011).

Business confidence surveys are direct reading of business confidence and are generally among the first real activity variables to be released monthly; therefore, market participants view them with great importance. Again, the “publication effect” can help explain the reason why business confidence might have predictive power for the stock market (Collins 2001). Another possible explanation is that business managers have a very good sense of the changes in the economy. If business managers notice improved business conditions, they may become more optimistic about future economic growth and respond to survey questions accordingly. As their optimism rises, they are more willing to take risks and demand lower returns on their investments, creating a negative relation between changes in business confidence and future aggregate stock returns in the form of higher current stock prices (Guzman 2007).

IV. Data and Methodology

a. Data

Our CCI analysis examines the relationship between stock returns and the CCI; and our BCI analysis examines the relationship between stock returns and the BCI. There were, in total, twelve individual countries involved in both analyses: Brazil, China, Germany, Greece, Japan, Korea, Mexico, Spain, Thailand, Turkey, the UK, and the US.

The monthly stock price indices used in both analyses were obtained from the MSCI Global Equity Indices database. According to the MSCI Index definitions, to construct a country stock price index, "every listed security in the market is identified. Securities are free float adjusted, classified in accordance with the Global Industry Classification Standard, and screened by size, liquidity and minimum free float."[9] We obtained each country stock price index from MSCI at the price index level, in USD currency, with no categorization of value or growth securities, and at standard size (large and mid cap). All of our twelve countries fall into either the Developed Markets classification or the Emerging Markets classification according to the MSCI Market Classification Framework[10]. Developed Markets and Emerging Markets Standard Indices follow the MSCI Global Investable Market Indices Methodology since June 2008. The MSCI Global Investable Market Indices Methodology[11] indicates that MSCI Standard Indices cover all investable large and mid cap securities and target approximately 85% of each market's free-float adjusted market capitalization. Because the MSCI Global Equity Indices provide "exhaustive equity market coverage for over 75 countries in the Developed, Emerging and Frontier Markets, applying a consistent index construction and maintenance

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[9] Accessed at: http://www.msci.com/products/indices/tools/index.html#Country

[10] Accessed at: http://www.msci.com/resources/products/indices/global_equity_indices/gimi/stdindex/MSCI_Market_Classification_Framework.pdf

[11] Accessed at: http://www.msci.com/eqb/methodology/meth_docs/MSCI_Nov10_GIMIMethod.pdf

methodology", using the MSCI Global Equity Indices allows for "meaningful global views and cross regional comparisons across all market capitalization size"[12]. Table 1 lists the time period of available MSCI stock price indices data for each country. The monthly stock returns are then calculated using the log return formula: the first difference of the logarithm of stock prices. The CCI and the BCI are usually released at the end of each month; therefore, in order to synchronize stock return observations and CCI and BCI observations, the monthly stock returns are also measured at the end of the month.

[TABLE 1 HERE]

For most countries, there are usually only one official CCI and one official BCI collected by a government or private agency and released at the end of each month (monthly data), except for the Japan BCI and the Thailand BCI which are released at the end of each quarter (quarterly data). Quarterly data is converted to monthly data by using the last available values for months without data as in Baker and Wurgler (2006) and Schmeling (2009). The Organization for Economic Co-operation and Development (OECD) then gather this data from each individual national source for most OECD countries and for some non-OECD countries. The OECD categorizes the CCI and the BCI as Consumer Opinion Surveys and Business Tendency Surveys correspondingly in their real-time online database. The CCI usually aims to measure consumer tendencies and expectations for the general economic and business situation, future income and personal finances, job opportunities, and the propensity to purchase. The OECD's Business Tendency Surveys database includes the BCI data for several different sectors: manufacturing, construction, retail trade, services, and non-manufacturing. The

[12] According to MSCI Global Equity Indices overview: http://www.msci.com/products/indices/

manufacturing BCI was chosen for this study because it is available for all countries and generally covers the longest period of time. The BCI usually aims to reflect the executives' judgments on recent past developments, the current situation, and prospects for the next few months of their enterprises. The BCI surveys usually ask about production (present and future prospects), orders inflow, order books, stocks of finished goods, and capacity utilization. Table 1 lists the time period of the available CCI and BCI data for each country. There are, however, minor differences in the methodology each country employs to create surveys (such as survey questionnaires and interview procedures) and aggregate data. Details about the agency responsible for collecting data and the types of questions each country asks in surveys can be found in Table 2 for the CCI and Table 3 for the BCI[13].

[TABLE 2 HERE]

[TABLE 3 HERE]

For all twelve countries, the time period of the available CCI and BCI data always falls within the time period of available stock price indices data (see Table 1). Therefore, in order to make reasonable comparisons between countries, we performed the CCI analysis and the BCI analysis for all twelve countries on two consistent time periods respectively: from April 2001 to September 2013 for the CCI, and from April 1995 to September 2013 for the BCI. We chose the time period between April 2001 and September 2013 for the CCI because this period has data for almost all countries in our study (except for Turkey which only has the CCI data from January 2004 to September 2013) and still

[13] Additional information regarding the methodology each country employs can be found on the OECD main economic indicators webpage: http://stats.oecd.org/mei/default.asp?lang=e or can be looked up from each country's direct source.

allows for a reasonable number of observations for further analysis. We also chose the time period between April 1995 and September 2013 for the BCI because this period has data for almost all countries in our study (except for Mexico and China which only have the BCI data from January 1998 to September 2013 and from February 2000 to September 2013 correspondingly) and still allows for a reasonable number of observations for further analysis, especially after taking into consideration the quarterly BCI data with fewer observations of Thailand and Japan. Additionally, besides using the selected data[14], we also performed similar analyses on the full series of each country's CCI and BCI. The results were then compared with that of the shorter selected time periods.

b. Methodology

We based our analysis on three similar methodologies proposed by Otoo (1999), Jansen and Nahuis (2003), and Bremmer (2008). This section will explain in details the four main steps involved in the analysis of a specific country. First, we transformed the country's stock price index (stock prices) into their natural logarithms. Second, we conducted unit root tests for the logarithm of stock prices, the CCI, and the BCI. Unit root testing indicated the need to difference all variables to meet the stationarity condition; therefore, we calculated the first difference of the logarithm of stock prices, the CCI, and the BCI. We then used the first-differenced data for all subsequent analysis. As discussed earlier, the first difference of the logarithm of stock prices is approximately stock returns. Third, we estimated two two-equation vector autoregression (VAR) models for the CCI analysis and the BCI analysis respectively. Fourth, we conducted Granger-causality tests

[14] Data within the selected periods: April 2001 - September 2013 (for the CCI) and April 1995 - September 2013 (for the BCI)

for the two estimated VAR models and made inferences regarding the Granger-causality direction between stock returns and the CCI and the BCI.

1) Log transformation

Because many time series variables have overall trends of exponential growth, the first thing researchers usually do with them is taking their natural logarithms. For example, if X_t is a time series variable with an overall trend growth rate of g and a variance e_t that is proportional to the current level, the series is mathematically denoted as:

$$X_t = X_{t-1} + g*X_{t-1} + e_t*X_{t-1}$$

Therefore, if g grows exponentially, X_t also grows exponentially and e_t*X_{t-1} (the variance) will grows exponentially. It then become problematic to fit time series models; hence, we take the natural logarithm of X_t to create the $\ln X_t$ series with a linear time trend instead. This is a common technique used for economic data to stabilize the series with exponential growth and nonstable variance. Lutkepohl and Xu (2012) conclude that if the logarithm transformation in fact makes the variance more homogeneous throughout the sample, using the logarithms can result in dramatic gains in forecasting precision. Specifically, they show that using the natural logarithms of stock price indices in time series models can forecast much more precise results than using the original data.

2) Unit root tests

a) Stationarity

In time series analysis, stationarity is the necessary condition before any further investigation to avoid regressions with spurious results. Loosely speaking, stationary time series are series whose statistical properties do not change over time.

Strictly stationary time series must have their joint probability distribution not change when shifted in time. Mathematically, the condition is denoted as:

$F_x(x_{t1+\tau}, \dots, x_{tk+\tau}) = F_x(x_{t1}, \dots, x_{tk})$, for any k and τ. Where $F_x(x_{t1+\tau}, \dots, x_{tk+\tau})$

and $F_x(x_{t1}, \dots, x_{tk})$ represent the cumulative distribution function of the joint function of X_t.

Weakly stationary time series are series that become stable over time (reaching a constant mean and a constant variance over time) and the autocovariance function between X_{t1} and X_{t2} only depends on the interval between t_1 and t_2. This is the condition often used in practice and testing because the strictly stationary condition is generally considered too strict to be met. Mathematically, the condition is denoted as:

$E(X_t) = \mu$ does not depend on t

$Cov(X_t, X_{t+\tau}) = \gamma_\tau$ exists, is finite, and depends only on τ but not on □, for all τ

b) Augmented Dickey-Fuller tests

The stationarity of a time series can be checked using a unit root test. The simplest approach to test for a unit root starts with an autoregressive model with one lag:

$Y_t = \theta_0 + \phi Y_{t-1} + a_t$ AR(1)

Imagine writing the above equation from T lags ago (we can ignore the constant term for a moment for simplicity):

$Y_t = \phi^T Y_{t-T} + a_t + \phi a_{t-1} + \phi^2 a_{t-2} + \dots + \phi^T a_{t-T}$

We can see that if $|\phi| < 1$: $\phi^T \rightarrow 0$ as $T \rightarrow \infty$

$|\phi| = 1$: $\phi^T \rightarrow 1$ as $T \rightarrow \infty$

$|\phi| > 1$: $\phi^T \rightarrow \infty$ as $T \rightarrow \infty$

Therefore, if $|\phi|>=1$, Y_t will "explode" and can never reach either a stable mean or a stable variance, which violates the stationarity condition discussed above. If $|\phi| = 1$ (because in real life, it is very rare to have $|\phi| > 1$), we say a unit root exists. The simple Dickey-Fuller test checks whether or not a unit root exists in an AR(1) (Dickey and Fuller 1979).

If we simplify the above version of AR(1) by subtracting Y_{t-1} from both sides, we then have:

$$Y_t - Y_{t-1} = \theta_0 - (1 - \phi)Y_{t-1} + a_t$$

$$\Delta Y_t = \theta_0 - (1 - \phi)Y_{t-1} + a_t$$

The simple Dickey-Fuller test uses this simplified version of AR(1) and tests for the null hypothesis that $\phi = 1$, which also means the system has a unit root. However, this test is not applicable for more complicated AR(p) models with more than one lag. Therefore, Said and Dickey (1984) augmented the basic autoregressive unit root test to accommodate for more general AR(p) models with unknown orders and their test is referred to as the Augmented Dickey-Fuller (ADF) test. This is a well-known test and proved to be valid in large size samples.

ADF test equation:

$$Y_t = \theta_0 + \phi Y_{t-1} + \varphi_1 \Delta Y_{t-1} + \varphi_2 \Delta Y_{t-2} + \varphi_3 \Delta Y_{t-3} + \ldots + \varphi_p \Delta Y_{t-p} + a_t \quad \text{AR(p)}$$

$\rightarrow \Delta Y_t = \theta_0 + (\phi - 1)Y_{t-1} + \varphi_1\Delta Y_{t-1} + \varphi_2\Delta Y_{t-2} + \varphi_3\Delta Y_{t-3} + \ldots + \varphi_p\Delta Y_{t-p} + a_t$

Similarly, testing for a unit root here is also equivalent to testing for the null hypothesis that $\phi = 1$. Each test-statistic is then derived by including the number of dependent lags that minimizes the Akaike Information Criterion (AIC) for each specification[15]. The null hypothesis of this test is the existence of a unit root; therefore, we reject the null hypothesis (if p-value is small enough) when the series is stationary (Elder and Kennedy 2001). We used the ADF tests for both the level data and the first-differenced data. Using a level of significance equals to one percent, if the ADF tests indicate that the variables are nonstationary, but their first differences are stationary, all the subsequent regressions will be estimated using the first-differenced data of those series. The first difference of the logarithm of stock prices is approximately stock returns.

3) VAR models

The vector autoregression (VAR) model is an n equations, n variables model in which each variable is in turn explained by its own lagged values and lagged values of the remaining n-1 variables. It is an extension from the univariate autoregressive model to the dynamic multivariate time series (Hamilton 1994). This study estimates two two-equations VAR models for the CCI analysis and the BCI analysis correspondingly.

a) Equation

For the CCI analysis, we estimated our first two-equations VAR model with two variables: the CCI and the stock price index (stock prices). The CCI in month t is denoted

[15] Akaike Information Criterion (AIC) and Schwarz's Bayesian Information Criterion (SBIC) are two common criteria used to select the number of lags. We only report here the results based on using the AIC. Using the SBIC still draws similar results.

as C_t, and the given stock price index in month t is denoted as S_t. Therefore, the first difference of the CCI in month t is denoted as ΔC_t and the first difference of the logarithm of stock prices in month t is denoted as $\Delta \ln S_t$ (stock returns). There are two equations in the model to be estimated.

CCI VAR model:

Equation I: $\Delta \ln S_t = \sigma + \sum_{i=1}^{N} \theta_i \Delta C_{t-i} + \sum_{i=1}^{N} \varphi_i \Delta \ln S_{t-i} + e_t$

Equation II: $\Delta C_t = \rho + \sum_{i=1}^{N} \delta_i \Delta C_{t-i} + \sum_{i=1}^{N} \gamma_i \Delta \ln S_{t-i} + u_t$

(e_t and u_t are error terms)

For the BCI analysis, we estimated our second two-equations VAR model with two variables: the BCI (manufacturing) and the stock price index (stock prices). The BCI in month t is denoted as B_t, and the given stock price index in month t is denoted as S_t. Therefore, the first difference of the BCI in month t is denoted as ΔB_t and the first difference of the logarithm of stock prices in month t is denoted as $\Delta \ln S_t$ (stock returns). There are two equations in the model to be estimated.

BCI VAR model:

Equation III: $\Delta \ln S_t = \sigma + \sum_{i=1}^{N} \theta_i \Delta B_{t-i} + \sum_{i=1}^{N} \varphi_i \Delta \ln S_{t-i} + e_t$

Equation IV: $\Delta B_t = \rho + \sum_{i=1}^{N} \delta_i \Delta B_{t-i} + \sum_{i=1}^{N} \gamma_i \Delta \ln S_{t-i} + u_t$

(e_t and u_t are error terms)

b) Lag structure

It is worth noting that the VAR models are very sensitive to the number of lags used[16]. More specifically, too many lags could increase the forecasting error due to overfitting, while too few lags could leave out relevant information such as significant lags (Stock and Watson 2001, Jones 1989). Therefore, the decision about the appropriate number of lags should be based on both economic theories and statistical techniques such as information criteria. There are three main information criteria that are used to determine a proper lag structure: the Akaike's information criterion (AIC), the Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC). According to Ivanov and Kilian (2001), the Akaike’s information criterion (AIC) is best suited for monthly VAR models, the HQIC is more accurate for quarterly VAR models with over 120 observations, and the SBIC works best for quarterly VAR models with any sample size. Table 4 and Table 5 list the optimal lag selection based on all three information criteria for the CCI analysis and the BCI analysis correspondingly.

[TABLE 4 HERE]

[TABLE 5 HERE]

Previous studies on this topic primarily used either the AIC or the SBIC to select the optimal lag. Bremmer (2008) used the AIC and selected the maximum lag at either one or two for the US stock price indices. Karnizova and Khan (2010) also used the AIC for their study. Jansen and Nahuis (2003) used the SBIC and selected the maximum lag at one for all countries (the AIC would also select the maximum lag at one for all countries in

[16] In Equation I, II, III, and IV, it means how far i go up to.

their study). Schmeling (2009) also used the SBIC for his study. According to Thornton and Batten (1985), the AIC tends to select longer maximum lag especially for large sample size, while the SBIC tends to select shorter maximum lag especially for small sample size. Furthermore, previous studies on this topic generally demonstrate that the causal relationship between stock returns and consumer and business confidence occurs at short time horizons (Jansen and Nahuis 2003, Bremmer 2008, and Schmeling 2009); therefore, using the SBIC to select the shorter maximum lag structure might make both economic and statistic sense. Using the same line of reasoning, Atukeren, Korkmaz, and Çevik (2012) limited the maximum lag structure in their study to up to three months. According to Table 4 and Table 5, the longest maximum lag structure identified by the SBIC for both the CCI analysis and the BCI analysis of our study is also three[17].

3) Granger-causality tests

Granger causality test (Granger, 1969) is designed to detect causal direction between two time series. More precisely, the Granger causality test detects correlations between the current value of one variable and the past values of another variable. Based on Granger's definition of causality, Sims (1980) provided a variant of Granger-causality test. For a stationary time series X_t, consider the following autoregressive (AR) prediction of the current value of X_t based on N past values of X:

$$X_t = m + \sum_{i=1}^{N} a_i X_{t-i} + e_t \quad (1)$$

[17] For CCI analysis, all other countries except for Japan have optimal lag at one. Japan has optimal lag at three. For BCI analysis, all other countries except for Japan and Germany have optimal lag at one. Japan again has optimal lag at three and Germany has optimal lag at two.

Here e_t is the prediction error whose magnitude can be evaluated by its variance $var(e_t)$. Suppose that simultaneously we also have another stationary time series Y_t. Consider the following prediction of the current value of X_t based both on its own past values and the past values of Y_t:

$$X_t = \rho + \sum_{i=1}^{N} \alpha_i X_{t-i} + \sum_{i=1}^{N} \beta_i Y_{t-i} + v_t \quad (2)$$

If the prediction of the current value of X_t improves by incorporating the past values of Y_t, or, mathematically, $var(v_t)<var(e_t)$, then we can say that Y_t Granger-causes X_t. Similarly, we may consider

$$Y_t = n + \sum_{i=1}^{N} b_i Y_{t-i} + k_t \quad (3) \qquad \text{and} \qquad Y_t = \sigma + \sum_{i=1}^{N} \varphi_i Y_{t-i} + \sum_{i=1}^{N} \gamma_i X_{t-i} + u_t \quad (4)$$

Then, we can say that X_t Granger-causes Y_t if $var(u_t)<var(k_t)$. Equation (2) and (4) are called unrestricted equations, while equation (1) and (3) are called restricted equations. Equation (2) and (4) together form a bivariate VAR model of two time series X_t and Y_t (Chen, Rangarajan, Feng, and Ding 2004).

The formal Granger-causality test uses a series of t-tests and F-tests on the null hypothesis that $\beta_1 = \beta_2 = \beta_3 = \ldots = \beta_N = 0$ in equation (2) or $\gamma_1 = \gamma_2 = \gamma_3 = \ldots = \gamma_N = 0$ in equation (4). Therefore, the null hypothesis is the equivalent of no existence of Granger-causality from Y_t to X_t or X_t to Y_t respectively.

According to Sims (1980), F-statistic is calculated as follow:

$$F = [(R^2_{UR} - R^2_{R})/m] / [(1 - R^2_{UR})/(n - 2m - 1)]$$

Where:

$R^2_{UR} = R^2$ of unrestricted equation

$R^2_R = R^2$ of restricted equation

n = the number of observations

m = the number of lagged periods

We then can apply this to our two bivariate VAR models:

CCI VAR model,

$$\Delta \ln S_t = \sigma + \sum_{i=1}^{N} \theta_i \Delta C_{t-i} + \sum_{i=1}^{N} \varphi_i \Delta \ln S_{t-i} + e_t \text{ (I)}$$

$$\Delta C_t = \rho + \sum_{i=1}^{N} \delta_i \Delta C_{t-i} + \sum_{i=1}^{N} \gamma_i \Delta \ln S_{t-i} + u_t \text{ (II)}$$

and BCI VAR model,

$$\Delta \ln S_t = \sigma + \sum_{i=1}^{N} \theta_i \Delta B_{t-i} + \sum_{i=1}^{N} \varphi_i \Delta \ln S_{t-i} + e_t \text{ (III)}$$

$$\Delta B_t = \rho + \sum_{i=1}^{N} \delta_i \Delta B_{t-i} + \sum_{i=1}^{N} \gamma_i \Delta \ln S_{t-i} + u_t \text{ (IV)}$$

For our CCI VAR model, in equation I, if $\theta = 0$ for every i (condition A), we cannot reject the null hypothesis that the CCI does not Granger-cause stock returns; similarly, in equation II, if $\gamma = 0$ for every i (condition B), we cannot reject the null hypothesis that stock returns do not Granger-cause the CCI.

With the Sims test, the direction of Granger-causality is judged as follows:

1) Condition A does not hold, Condition B holds: CCI Grange-causes stock returns

(CCI→Stock)

2) Condition A holds, Condition B does not hold: Stock returns Granger-cause CCI (Stock→CCI)

3) Both Condition A and Condition B hold: Feedback between CCI and stock returns (CCI ↔ Stock)

4) Neither Condition A nor Condition B holds: CCI and stock returns are independent

For the BCI VAR model, in equation III, if $\theta = 0$ for every i (condition C), we cannot reject the null hypothesis that the BCI does not Granger-cause stock returns; and in equation IV, if $\gamma = 0$ for every i (condition D), we cannot reject the null hypothesis that stock returns do not Granger-cause the BCI.

With Sims test, the direction of Granger-causality is judged as follows:

1) Condition C does not hold, Condition D holds: BCI Granger-causes stock returns (BCI→Stock)

2) Condition C holds, Condition D does not hold: Stock returns Granger-cause BCI (Stock→BCI)

3) Both Condition C and Condition D hold: Feedback between BCI and stock returns (BCI ↔ Stock)

4) Neither Condition C nor Condition D holds: BCI and stock returns are independent

It is also worth noting that Granger-causality does not necessarily mean causality in the normal sense. Therefore, any causal inferences must be deducted with caution.

V. Results

A. CCI analysis

1) Unit roots tests

a) ADF tests

Table 6 reports the test-statistics from the ADF tests for stock price indices of all twelve countries from the selected data[18] and the full data. At one percent significant level, ADF test-statistics indicate that the natural logarithms of all levels stock price indices are nonstationary, but their first differences are stationary. Therefore, subsequent regressions are estimated with the first-differenced data of those series to avoid spurious results.

[TABLE 6 HERE]

Table 7 reports the test-statistics from the ADF tests for the CCI of all twelve countries from the selected data and the full data. Using the selected data only, at one percent significant level, the levels CCI of all twelve countries are nonstationary, but their first differences are stationary. Using the full data, results are similar for all countries except for Germany. Therefore, subsequent regressions are estimated with the first-differenced data of those series to avoid spurious results. Even though Germany has its levels CCI from the full data being stationary already, for consistency, we still use the first-differenced data of its CCI for subsequent regressions[19].

[TABLE 7 HERE]

b) Cointegration

[18] From April 2001 to Sep 2013

[19] The subsequent analysis results are still the same even if we use the levels data instead (see Appendix A)

Previous studies working with nonstationary variables usually test for cointegration between variables before proceeding with building VAR models and conducting Granger-causality tests[20]. If a time series is nonstationary but its first difference is stationary, we say that the series is integrated of order 1 or I(1). The order is the minimum number of differences required to transform the nonstationary series into a stationary series. If the two series are integrated of the same order, it is possible that a linear combination of them is stationary, which means the two series are cointegrated. Cointegration between two series implies common stochastic trend and existence of long-run equilibrium, which can be used to improve long-run forecast accuracy. With cointegration, we can also separate short-run and long-run relationship. It is believed that when conintegration exists, there is an additional causal channel (error correction term) for one variable to affect the other, in which the Granger-causality test based on a VAR system cannot capture (Engle and Granger 1987, Enders 319-372).

Because stock prices and the CCI are both I(1), they might be cointegrated; however, for this paper, the focus is on stock returns, which is the first difference of the logarithm of stock prices[21], not the stock prices; therefore, we can pay less attention to the cointegration (even if it exists) between stock prices and the CCI. We still checked for possible cointegration in each country using the well-known Johansen cointegration test (Johansen 1991) but found no evidence of cointegration in any country (see Appendix C). This is consistent with existing literature that the relationship between the stock market and the CCI occurs at the shortrun rather than the longrun[22].

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[20] See Jansen and Nahuis 2003, Karnizova and Khan 2010, Antonios and Athanasios 2013.
[21] Which is stationary and not integrated
[22] Otoo 1999, Jansen and Nahuis 2003, Karnizova and Khan 2010, and Bremmer 2008

2) VAR model

It is worth noting that after differencing the natural logarithms of levels stock price indices from the previous step, we are now working with stock returns and the CCI in our CCI VAR model.

Table 8 reports the significant lags and their signs (negative or positive) in the CCI VAR model of all twelve countries from the selected data and the full data. In Equation I, we regressed the current stock returns on their own lagged values and the lagged values of the CCI. Since we were not interested in the relationship between stock returns and their own past values, we focused only on the significant lags of the CCI. The significant lags of the CCI in the model can inform us about the Granger causal effects of consumer confidence on stock returns. In Equation II, we regressed the CCI on its own lagged values and the lagged values of stock returns. Again, since we were not interested in the relationship between the CCI and its own past values, our main interest was the significant lags of stock returns, which can inform us about the Granger causal effects of stock returns on consumer confidence.

[TABLE 8 HERE]

In order to conclude about the significance of those lags and the causal relationship appearing in our CCI VAR model, formal Granger-causality tests were conducted and the results are presented in the next section.

3) Granger-causality tests

Table 9 reports the F-statistics of the Granger-causality tests for the CCI VAR model from the selected data and the full data. In Equation I, at five percent significant level, if the F-statistic is significant, condition A[23] does not hold; if the F-statistic is insignificant, condition A holds. In Equation II, at five percent significant level, if the F-statistic is significant, condition B[24] does not hold; if the F-statistic is insignificant, condition B holds (refer back to page 25-27).

a) April 2001 – September 2013 only

According to Table 9, only in Japan, condition A does not hold and condition B holds, which implies that the CCI Granger-causes stock returns but not vice versa. In Brazil and the UK, both condition A and condition B hold, inferring that there is a bidirectional relationship between stock returns and the CCI. In China, Germany, Greece, Korea, Turkey, Spain, and the US, condition A holds and condition B does not hold; therefore, we can infer that stock returns Granger-cause the CCI but not vice versa in those countries. In other two countries (Mexico and Thailand), neither condition A nor condition B holds, implying that stock returns and the CCI are relatively independent.

[TABLE 9 HERE]

b) Full series

Except for China and the UK, the results are similar if we use the full data instead. In China, using the full data, the F-statistics indicate that stock returns and the CCI are independent whereas using the selected data, the F-statistics indicate that stock returns Granger-cause the CCI but not vice versa, implying that stock returns did not Granger-cause consumer confidence[25] but started to have more significant effects since recently

[23] $\theta = 0$ for every i
[24] $\gamma = 0$ for every i
[25] Full data covered Jan 1993 – Sep 2013

(2001 - 2013). In the UK, using the full data, the F-statistics indicate that stock returns Granger-cause the CCI but not vice versa whereas using the selected data, the F-statistics indicate a bidirectional relationship, implying that consumer confidence did not Granger-cause stock returns[26] but also started to have more significant effects since recently (2001 - 2013), resulting in a bidirectional relationship.

It appears that for both China and the UK, since recently, consumer confidence has become more integrated with the stock market performance: increasingly influencing or being influenced by the stock market. This might have resulted from the recent development of the financial market in these countries, inducing more market participation from consumers. The recent financial crisis might have also amplified the effects of stock returns on consumer confidence[27] and vice versa[28].

B. BCI analysis

1) Unit root tests

a) ADF tests

Table 10 reports the test-statistics from the ADF tests for stock price indices of all twelve countries from the selected data[29] and the full data. At one percent significant level, ADF test-statistics indicate that the natural logarithms of all levels stock price indices are

[26] Full data covered Jan 1974 - Sep 2013
[27] Karnizova and Khan (2010) concluded that confidence channel might amplify the effects of stock returns on the aggregate consumption in Canada, especially during periods of negative changes observed since the global financial crisis from 2007 to 2008.
[28] According to Shiu-Sheng Chen (2011), the impact of consumer confidence is greater in bear markets and the greater the market pessimism the higher the probability of switching from a bull to a bear market.
[29] From April 1995 to September 2013

nonstationary, but their first differences are stationary. Therefore, subsequent regressions are estimated with the first-differenced data of those series to avoid spurious results.

[TABLE 10 HERE]

Table 11 reports the test-statistics from the ADF tests for the BCI of all twelve countries from the selected data and the full data. Using the selected data, at one percent significant level, the levels BCI of eight countries (China, Greece, Japan, Korea, Mexico, Spain, Thailand, and the US) are nonstationary, but their first differences are stationary. Using the full data, at one percent significant level, the levels BCI of seven countries (China, Greece, Japan, Korea, Mexico, Spain, and Thailand) are nonstationary, but their first differences are stationary. Therefore, subsequent regressions are also estimated with the first-differenced data of those series to avoid spurious results. Even though the levels BCI of Brazil, Germany, Turkey, the UK, and the US are already stationary, for consistency, we still use the first-differenced data of these BCI series for subsequent regressions[30].

[TABLE 11 HERE]

b) Cointegration

Because stock prices and the BCI are both I(1) in many countries (except for Brazil, Germany, Turkey, and the UK), they might be cointegrated. However, again, for this paper, the focus is on stock returns; therefore, we can pay less attention to the cointegration (even if it exists) between stock prices and the BCI. We still checked for possible cointegration in each country but found no evidence of cointegration in any country except for China

[30] The subsequent analysis results are still the same even if we use the levels data instead (see Appendix B)

(see Appendix D). As a result, we proceeded with the VAR model and Granger-causality tests to examine the short-run effects.

2) VAR model

Table 12 reports the significant lags and their signs (negative or positive) in the BCI VAR model from the selected data and the full data. In Equation III, we regressed the current stock returns on their own lagged values and the lagged values of the BCI. For the scope of this paper, we only focused on the significant lags of the BCI. The significant lags of the BCI in the model can inform us about the Granger causal effects of business confidence on stock returns. In Equation IV, we regressed the BCI on its own lagged values and the lagged values of stock returns. Again, for the scope of this paper, we only focused on the significant lags of stock returns, which can inform us about the Granger causal effects of stock returns on business confidence.

[TABLE 12 HERE]

In order to conclude about the significance of those lags and the causal relationship appearing in our BCI VAR model, formal Granger-causality tests were conducted and the results are presented in the next section.

3) Granger-causality tests

Table 13 reports the F-statistics of Granger-causality tests for the BCI VAR model from the selected data and the full data. In Equation III, at five percent significant level, if the F-statistic is significant, condition C[31] does not hold; if the F-statistic is insignificant, condition C holds. In Equation IV, at five percent significant level, if the F-statistic is

[31] $\theta = 0$ for every i

significant, condition D[32] does not hold; if the F-statistic is insignificant, condition D holds (refer back to page 25-27).

a) April 1995 – September 2013 only

According to Table 13, only in Korea, condition C does not hold and condition D holds, implying that the BCI Granger-causes stock returns but not vice versa. In Thailand and Turkey, neither condition C nor condition D holds; therefore, we can infer that stock returns and the BCI are relatively independent in those two countries. In Germany, both condition A and condition B hold, inferring that there is a bidirectional relationship between stock returns and the BCI. In all other eight countries (Brazil, China, Greece, Japan, Korea, Mexico, Spain, the UK, and the US), condition C holds and condition D does not hold, inferring that stock returns Granger-cause the BCI but not vice versa in those countries.

[TABLE 13 HERE]

b) Full series

Except for Germany and Greece, the results are similar if we use the full data instead. In Germany, using the full data, the F-statistics indicate that the BCI Granger-causes stock returns but not vice versa, whereas using the selected data, the F-statistics indicate a bidirectional relationship. In Greece, using the full data, the F-statistics indicate that stock returns and the BCI are independent, whereas using the selected data, the F-statistics indicate that stock returns in fact Granger-cause the BCI. These results imply that the effects of stock returns on business confidence have changed over time in Germany

[32] $\gamma = 0$ for every i

and Greece: stock returns did not Granger-cause business confidence; however, since recently (2001 – 2013), stock returns started to have more significant Granger-effects on business confidence.

Again, the results confirm the trend that since recently, market confidence (both consumer confidence and business confidence) has become more integrated with the stock market performance[33].

VI. Discussion

Table 14 summarizes the results from the Granger-causality tests for both the CCI analysis and the BCI analysis and groups countries into categories with similar Granger causal directions. To ensure consistency for comparison between countries, we look at the results from the selected data analysis. First of all, we note that the relationship between stock returns and consumer and business confidence has its own idiosyncratic properties in each country and there is no one conclusive causal relationship that might work for all. However, there are several inferences that can be deduced from the Granger-causality testing results.

Consistent with the majority of works in this domain, we also find that stock returns generally Granger-cause consumer and business confidence but not vice versa. We find that stock returns Granger-cause consumer confidence but not vice versa in seven out of twelve countries in our study, and Granger-cause business confidence but not vice versa in eight out of twelve countries in our study. For Brazil and the UK, there is a bidirectional relationship between stock returns and consumer confidence. For Germany, there is also a

[33] We previously discussed that consumer confidence has also become more integrated with the stock market. Refer back to section A.3.b for the discussion.

bidirectional relationship between stock returns and business confidence. This feedback relationship is worth further investigation because for a known efficient equity market like the US, there are only two unidirectional effects: Stock → CCI and Stock → BCI. This feedback relationship might indicate strong market participation together with herd-like investment behaviors and/or less efficient regulatory institutions and market integrity (see Chui, Titman and Wei 2009). Overall, the effects of stock returns on consumer and business confidence are quite strong: nine out of twelve countries for both the CCI and the BCI[34]. On the other hand, the effects of consumer and business confidence on stock returns appear to be relatively weak, which is consistent with the previous literature focusing on the US and the European stock markets.

The two main exceptions are Japan and Korea with the unidirectional effects running from the CCI to stock returns and from the BCI to stock returns respectively. These reverse effects might indicate strong herd-like investment behaviors and/or less efficient regulatory institutions and market integrity but together with relatively weak market participation. Because both countries are Asian countries, cultural factors might contribute to explaining the results.

Secondly, the effects of stock returns on consumer confidence are quite similar to that on business confidence[35]. In Brazil, China, Greece, Germany, Spain, the UK, and the US, stock returns Granger-cause both consumer and business confidence, whereas in Thailand, stock returns do not Granger-cause either consumer or business confidence.

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[34] If we consider the feedback relationship as two unidirectional effects

[35] If stock returns Granger-cause consumer confidence, stock returns will also Granger-cause business confidence in that country. If stock returns do not Granger-cause consumer confidence, stock returns will also not Granger-cause business confidence in that country. These two trends occur in eight out of twelve countries in our study.

Thirdly, it is worth noting that not in all countries do stock returns Granger-cause both consumer and business confidence. There are partial effects of stock returns[36] in Korea, Turkey, and Mexico. It appears that stock returns might have more significant effects on consumer and business confidence in developed and high-income countries such as Greece, Spain, Germany, the UK, and the US, while stock returns might have less significant effects in developing and middle-income countries such as Thailand, Turkey, and Mexico[37]. According to Demirguc-Kunt and Levine (2004), stock markets are larger, more active, and more efficient in richer countries, in which the financial systems are also more developed. They also found that countries "with a Common Law tradition, strong protection of shareholder rights, good accounting regulations, low levels of corruption, and no explicit deposit insurance" tend to have more developed financial systems, whereas countries "with a French Civil Law tradition, poor protection of shareholder and creditor rights, poor contract enforcement, high levels of corruption, poor accounting standards, restrictive banking regulations, and high inflation" tend to have less developed financial systems (81-139). As a result, we can expect that market participation will also be more active in richer countries with better laws and protections for their market participants, resulting in more significant effects of stock returns on consumer and business confidence.

VII. Conclusion

This paper studies the causal relationship between stock returns and consumer and

[36] Stock returns Granger-cause consumer confidence but not business confidence in Korea and Turkey, while stock returns Granger-cause business confidence but not consumer confidence in Mexico.
[37] According to the Global Financial Development Database (Nov 2013) by the World Bank, Greece, Korea, Spain, the UK, and the US are considered high-income OECD countries, while Brazil, Mexico, China, Turkey and Thailand are considered upper-middle-income countries.

business confidence indices for twelve countries in America, Europe and Asia.

Following the methodologies proposed by Otoo (1999), Jansen and Nahuis (2003), and Bremmer (2008), we used the VAR approach and conducted Granger-causality testing to investigate the possible causality between stock returns and consumer and business confidence indices. We first transformed each country's stock prices into their natural logarithms, then conducted unit root tests for each country's logarithm of stock prices, CCI, and BCI. Unit root testing indicated the need to difference all variables; therefore, we proceeded to calculate the first difference of the logarithm of stock prices, the CCI, and the BCI. The first difference of the logarithm of stock prices is approximately stock returns. Then, we estimated two two-equation VAR models and conducted Granger-causality tests in order to make inferences regarding the Granger-causality direction between stock returns and the CCI and the BCI.

Even though we found that the relationship between stock returns and consumer and business confidence has its own idiosyncratic properties in each country, stock returns still generally Granger-cause consumer and business confidence but not vice versa in many of our studied countries, with Japan and Korea as the two main exceptions. The unidirectional effects running from the CCI to stock returns and from the BCI to stock returns in Japan and Korea respectively might indicate strong herd-like investment behaviors and/or less efficient regulatory institutions and market integrity together with relatively weak market participation. Because both countries are Asian countries, cultural factors might have a significant explanatory role in this case. We also found that the effects of stock returns on consumer confidence are quite similar to those on business confidence, and the two types of effects seem to occur jointly. Additionally, the relationship between stock returns and consumer and business confidence appears to be stronger in more developed and higher income countries.

The comparison between the two analyses using selected and full data indicate that for most countries, the relationship between stock returns and consumer and business confidence has not changed over time. However, it appears for some countries (China, Germany, Greece, and the UK) that since recently, consumer and business confidence have become more integrated with the stock market performance: increasingly influencing or being influenced by the stock market. This might have resulted from the recent development of the financial market in these countries, inducing more market participation from consumers and businesses. The recent financial crisis might have also amplified the effects of stock returns on consumer and business confidence and vice versa.

If stock returns Granger-cause consumer and business confidence, rising (declining) stock markets may make consumers and businesses feel better (worse) about the future, and therefore induce them to spend and/or invest more (less). This implies that stock returns can have large effects on consumers' expenditure and businesses' investment, thus influence the economic output. If stock returns can affect the economic output via the market confidence channel, stock price indices might also be used as another leading economic indicator. For emerging economies where leading economic indicators are relatively scarce, not timely, and not reliable (Mauro 2003), if stock price indices can be used as a leading economic indicator, policymakers and economists can forecast the economic growth in a more timely and reliable manner by using the readily available stock market indices. The results of our study imply that for many countries in America, Europe and Asia, including emerging economies, the stock price indices indeed might be used as another economic leading indicator because stock returns do Granger-cause consumer and business confidence in those countries.

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Table 1: Time period of available data for each country

	Country	Stock prices (full series)	CCI (full series)	BCI (full series)
1	Brazil	Jan 1988 – Sep 2013	Jun 1994 – Sep 2013	Apr 1995 – Sep 2013
2	China	Jan 1993 – Sep 2013	Jan 1993 – Sep 2013	Feb 2000 – Sep 2013
3	Germany	Jan 1970 – Sep 2013	Jan 1973 – Sep 2013	Jan 1985 – Sep 2013
4	Greece	Jan 1988 – Sep 2013	Jan 1988 – Sep 2013	Jan 1988 – Sep 2013
5	Japan	Jan 1970 – Sep 2013	Apr 1982 – Sep 2013	Jun 1974 – Sep 2013
6	Korea	Jan 1988 – Sep 2013	Jan 1999 – Sep 2013	Jul 1991 – Sep 2013
7	Mexico	Jan 1988 – Sep 2013	Apr 2001 – Sep 2013	Jan 1998 – Sep 2013
8	Spain	Jan 1970 – Sep 2013	Jun 1986 – Sep 2013	Apr 1987 – Sep 2013
9	Thailand	Jan 1988 – Sep 2013	Aug 2000 – Sep 2013	Apr 1995 – Sep 2013
10	Turkey	Jan 1988 – Sep 2013	Jan 2004 – Sep 2013	Feb 1991 – Sep 2013
11	UK	Jan 1970 – Sep 2013	Jan 1974 – Sep 2013	Jan 1985 – Sep 2013
12	USA	Jan 1970 – Sep 2013	Jan 1978 – Sep 2013	Jan 1970 – Sep 2013

Table 2: Consumer Confidence Index for each country

	Country	Consumer confidence index
1	Brazil	Also known as the Index of the Consumer (ICC) and is collected by the Federaçao do comercio do Estado de São Paulo (FCESP). The index evaluates with reliable degree what the population feels is the general situation of the country and its future conditions.
2	China	China Consumer opinion surveys are conducted by China Economic Monitoring and Analysis Center of the National Bureau of Statistics.
3	Germany	Germany Consumer opinion surveys are also called “GfK-Wirtschaftsdienst Konsum-und Sparklima” (GfK financial services, consumer and savings climate) and is conducted by GfK Marktforschung. The sample size is 2000. The respondents are asked about their perceptions of the overall economic situation, their propensity to buy and their income expectations.
4	Greece	Greece Consumer opinion surveys are reported by the Eurostat. The sample size is 1500 households.
5	Japan	Japan Consumer opinion surveys are conducted by the Cabinet Office of the Economic and Social Research Institute, Japan. The sample size is 6720. The index measures consumers' opinions regarding current and future consumption, income and business conditions by combining their replies to five questions on their standard of living, income growth, commodity price increases, employment environment and optimal time for durable goods purchases.
6	Korea	Korea Consumer opinion surveys are collected by the National Statistical Office, Republic of Korea (KOSTAT). The survey is based on 2,000 nationwide representative households. The surveys ask about current living standard, domestic economic situation, prospective living standard, expected changes in total household income, spending plan, and expectations of domestic economic situation.
7	Mexico	Mexico Consumer opinion surveys are collected by the National Institute of Statistics, Geography and Informatics of Mexico. The sample size is 2336 urban households.
8	Spain	Spain Consumer opinion surveys are collected by Grupo Gallup España. The sample size is around 2000 households.
9	Thailand	The Consumer Confidence Index in Thailand is reported by the University of the Thai Chamber of Commerce. The index measures consumer’s outlook about current and future economic conditions, job prospects and income expectations. The index is based on a survey of around 2440 households.
10	Turkey	Turkey Consumer opinion surveys are collected by Turkish Statistical Institute. The sample size is 2000 households. The indicator aims at finding out consumer tendencies and expectations for general economic course, job opportunities, personal financial standing and market developments.
11	UK	UK Consumer opinion surveys are collected monthly by Martin Hamblin Gfk. The sample size is about 2000.
12	USA	USA Consumer opinion surveys are compiled by the Survey Research Center of the University of Michigan using the results of a consumer survey based on interviews conducted by telephone. The index measures consumers' attitude towards current and expected personal finances, expected business conditions and current buying conditions for durable goods.

Table 3: Business Confidence Index (manufacturing) for each country

	Country	Business confidence index (manufacturing)
1	Brazil	Brazil Business tendency surveys (manufacturing) are collected by Fundação Getúlio Vargas.
2	China	China Business tendency surveys (manufacturing) are collected by National Bureau of Statistics of China.
3	Germany	Germany Business tendency surveys (manufacturing) are collected by Institute for Economic Research (IFO). The sample size is 3600 firms.
4	Greece	Greece Business tendency surveys (manufacturing) are collected by Foundation of Economic and Industrial Research (FEIR / IOBE). The sample size is 1300 firms.
5	Japan	The index is derived from Bank of Japan's quarterly Short-term Economic Survey of Enterprises in Japan.
6	Korea	Korea Business tendency surveys (manufacturing) are derived from the Business Survey Index (BSI) carried out by the Bank of Korea. The sample size is 2902 corporations.
7	Mexico	Mexico Business tendency surveys (manufacturing) are derived from the Monthly Business Tendency Survey by Bank of Mexico. The sample size is about 1000 enterprises.
8	Spain	Spain Business tendency surveys (manufacturing) are compiled from the survey 'Encuesta de Coyuntura Industrial', conducted for 3500 enterprises by the Ministry of Industry.
9	Thailand	The index is collected by the Bureau of Trade and Economic Indices, Thailand. The survey covers a sample of around 1800 entrepreneurs.
10	Turkey	Turkey Business tendency surveys (manufacturing) are derived from the Quarterly Manufacturing Industry Tendency Survey, conducted by the State Institute of Statistics of Turkey. The sample size is 3500.
11	UK	United Kingdom Business tendency surveys (manufacturing) are collected from the Quarterly Industrial Trends Survey and the Monthly Trends Inquiry carried out by the Confederation of British Industry (CBI). The sample is 1500 respondents on average.
12	USA	Business tendency surveys (manufacturing) are compiled from the monthly Manufacturing Report On Business conducted by the Institute for Supply Management (ISM).

Table 4: Optimal lag selection using information criteria for the CCI analysis

		Apr 2001 – Sep 2013			Full series		
		AIC	HQIC	SBIC	AIC	HQIC	SBIC
1	Brazil	1	1	1	1	1	1
2	China	2	1	1	1	1	1
3	Germany	1	1	1	4	1	1
4	Greece	1	1	1	1	1	1
5	Japan	6	3	3	7	6	3
6	Korea	9	1	1	1	1	1
7	Mexico	1	1	1	1	1	1
8	Spain	1	1	1	1	1	1
9	Thailand	1	1	1	1	1	1
10	Turkey	1	1	1	1	1	1
11	UK	1	1	1	2	1	1
12	USA	1	1	1	2	2	1

Table 5: Optimal lag selection using information criteria for the BCI analysis

		Apr 1995 – Sep 2013			Full series		
		AIC	HQIC	SBIC	AIC	HQIC	SBIC
1	Brazil	2	2	1	2	2	1
2	China	4	3	1	4	3	1
3	Germany	2	2	2	2	2	2
4	Greece	3	1	1	2	1	1
5	Japan	3	3	3	3	3	3
6	Korea	4	3	1	4	4	1
7	Mexico	1	1	1	1	1	1
8	Spain	7	1	1	7	4	1
9	Thailand	6	6	1	6	6	1
10	Turkey	2	2	1	2	2	1
11	UK	3	1	1	3	1	1
12	USA	2	1	1	3	2	1

Table 6: Test-statistics from Augmented Dickey-Fuller tests for stock prices used in the CCI analysis

	Country	Test-statistic Apr 2001 – Sep 2013		Test-statistic Full series	
		Levels	First-differences	Levels	First-differences
1	Brazil	-1.7551	-5.8556**	-2.0057	-14.1335**
2	China	-2.0039	-7.1676**	-1.704	-5.4654**
3	Germany	-2.2686	-10.7872**	-2.3521	-21.4636**
4	Greece	-1.2636	-7.8058**	-1.4963	-10.7976**
5	Japan	-1.872	-7.7471**	-2.6567	-9.045**
6	Korea	-2.234	-5.1468**	-2.629	-5.8104**
7	Mexico	-1.8444	-7.6263**	-1.8444	-7.6263**
8	Spain	-1.5957	-11.2703**	-2.2604	-10.4344**
9	Thailand	-2.3715	-11.6882**	-2.436	-12.4388**
10	Turkey	-2.622	-10.0034**	-2.622	-10.0034**
11	UK	-2.3778	-6.1779**	-1.8981	-15.6821**
12	USA	-2.1366	-7.0954**	-1.6441	-19.5115**

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 7: Test-statistics from Augmented Dickey-Fuller tests for the CCI

	Country	Test-statistic Apr 2001 – Sep 2013		Test-statistic Full series	
		Levels	First-differences	Levels	First-differences
1	Brazil	-2.6047	-12.1562**	-3.337	-10.9866**
2	China	-3.8835*	-11.2833**	-3.8*	-10.7261**
3	Germany	-3.1601	-4.2701**	-4.2642**	-7.9392**
4	Greece	-2.5786	-13.297**	-2.283	-13.0471**
5	Japan	-2.222	-3.9398**	-3.5405	-5.3002**
6	Korea	-3.7164*	-8.6102**	-3.5226*	-8.6734**
7	Mexico	-2.331	-7.6682**	-2.331	-7.6682**
8	Spain	-2.3937	-11.497**	-3.1177	-5.9059**
9	Thailand	-2.2357	-11.4957**	-2.1601	-11.6601**
10	Turkey	-2.3717	-6.6071**	-2.3717	-6.6071**
11	UK	-1.7416	-12.2467**	-3.761*	-12.0314**
12	USA	-3.1806	-7.908**	-3.0861	-9.9935**

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 8: Significant lags in the CCI VAR model: Equation 1 and Equation 2

CCI VAR model	Apr 2001 – Sep 2013		Full series	
	Equation 1 (Y variable: Stock index → Null hypothesis: Consumer confidence index does not have an impact on stock returns)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock returns do not have an impact on consumer confidence index)	Equation 1 (Y variable: Stock index → Null hypothesis: Consumer confidence index does not have an impact on stock returns)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock returns do not have an impact on consumer confidence index)
	Significant coefficients	Significant coefficients	Significant coefficients	Significant coefficients
	Confidence index*	Stock index*	Confidence index*	Stock index*
Brazil	Lag 1 (positive)**	Lag 1 (positive)**	Lag 1 (positive)*	Lag 1 (positive)**
China	None	Lag 1 (positive)*	None	None
Germany	None	Lag 1 (positive)**	None	Lag 1 (positive)***
Greece	None	Lag 1 (positive)**	None	Lag 1 (positive)*
Japan	Lag 1 (positive)**	None	Lag 1, 2 (positive)***	None
Korea	None	Lag 1 (positive)***	None	Lag 1 (positive)***
Mexico	None	None	None	None
Spain	None	Lag 1 (positive)**	None	Lag 1 (positive)***
Thailand	None	None	None	None
Turkey	None	Lag 1 (positive)**	None	Lag 1 (positive)**
UK	Lag 1 (positive)**	Lag 1 (positive)**	None	Lag 1 (positive)**
USA	None	Lag 1 (positive)***	None	Lag 1 (positive)***

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 9: Granger-causality F-statistics for the CCI VAR model: Equation 1 and Equation 2

CCI VAR model	Apr 2001 – Sep 2013 F-statistic		Full series F-statistic	
	Equation 1 (Null hypothesis: Consumer confidence does not Granger-cause stock returns)	Equation 2 (Null hypothesis: Stock returns do not Granger-cause consumer confidence)	Equation 1 (Null hypothesis: Consumer confidence does not Granger-cause stock returns)	Equation 2 (Null hypothesis: Stock returns do not Granger-cause consumer confidence)
Brazil	8.44** (0.0042)	8.87** (0.0034)	6.06* (0.015)	7.21** (0.0078)
China	0.04 (0.84)	4.23* (0.042)	1.67 (0.2)	0.21 (0.65)
Germany	2.4 (0.12)	10.1** (0.0018)	3.34 (0.068)	30.1*** (6.5e-08)
Greece	0 (0.99)	7.51** (0.0069)	0.01 (0.93)	6.6* (0.011)
Japan	4.09** (0.0081)	2.31 (0.08)	8.62 *** (1.5e-05)	1.83 (0.14)
Korea	0.69 (0.41)	23.7*** (2.9e-06)	0.22 (0.64)	26.7 *** (6.6e-07)
Mexico	0.73 (0.39)	0.71 (0.4)	0.73 (0.39)	0.71 (0.4)
Spain	0.36 (0.55)	7.07** (0.0087)	0.34 (0.56)	23.9*** (1.6e-06)
Thailand	0.13 (0.72)	0.3 (0.58)	0.1 (0.75)	0.5 (0.48)
Turkey	0.16 (0.69)	8.68** (0.0039)	0.16 (0.69)	8.68** (0.0039)
UK	7.69** (0.0063)	7.11** (0.0086)	0.66 (0.42)	8.12** (0.0046)
USA	0.41 (0.52)	14.6*** (2e-04)	0.13 (0.72)	29.2 *** (1.1e-07)

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 10: Test-statistics from Augmented Dickey-Fuller tests for stock prices used in the BCI analysis

	Country	Test-statistic Apr 1995 – Sep 2013		Test-statistic Full series	
		Levels	First-differences	Levels	First-differences
1	Brazil	-1.9057	-14.1703**	-1.9057	-14.1703**
2	China	-2.2066	-7.8253**	-2.2066	-7.8253**
3	Germany	-2.4301	-13.7442**	-3.7304*	-17.8051**
4	Greece	-1.365	-9.6135**	-1.4963	-10.7976**
5	Japan	-2.4579	-6.6835**	-1.3958	-10.1689**
6	Korea	-2.8737	-13.8363**	-2.4923	-15.2105**
7	Mexico	-2.4755	-12.9324**	-2.4755	-12.9324**
8	Spain	-2.1496	-13.9903**	-2.1316	-17.0908**
9	Thailand	-2.5895	-14.8547**	-2.5895	-14.8547**
10	Turkey	-2.8031	-15.0663**	-3.9717*	-15.6071**
11	UK	-2.8021	-9.1467**	-3.2587	-17.7718**
12	USA	-2.5315	-10.1502**	-2.0748	-21.4643**

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 11: Test-statistics from Augmented Dickey-Fuller tests for the BCI

	Country	Test-statistic Apr 1995 – Sep 2013		Test-statistic Full series	
		Levels	First-differences	Levels	First-differences
1	Brazil	-4.3271**	-7.8921**	-4.3271**	-7.8921**
2	China	-2.5834	-4.5112**	-2.5834	-4.5112**
3	Germany	-4.1451**	-4.4651**	-4.6996**	-5.6273**
4	Greece	-2.1539	-6.1928**	-2.6267	-10.3172**
5	Japan	-3.5538*	-4.2192**	-3.5295*	-6.3456**
6	Korea	-3.1992	-4.4138**	-3.2689	-4.7777**
7	Mexico	-3.629*	-9.259**	-3.629*	-9.259**
8	Spain	-3.3798	-4.9223**	-3.7783*	-5.8613**
9	Thailand	-2.9861	-4.0499**	-2.9861	-4.0499**
10	Turkey	-4.4588**	-4.1042**	-5.0921**	-7.2729**
11	UK	-4.1066**	-4.8532**	-3.9174**	-5.153**
12	USA	-3.6435*	-14.6463**	-5.5452**	-6.7209**

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 12: Significant lags in the BCI VAR model: Equation 1 and Equation 2

BCI VAR model	Apr 1995 – Sep 2013		Full series	
	Equation 1 (Y variable: Stock index → Null hypothesis: Business confidence index does not have an impact on stock returns)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock returns do not have an impact on Business confidence index)	Equation 1 (Y variable: Stock index → Null hypothesis: Business confidence index does not have an impact on stock returns)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock returns do not have an impact on Business confidence index)
	Significant coefficients	Significant coefficients	Significant coefficients	Significant coefficients
	Confidence index*	Stock index*	Confidence index*	Stock index*
Brazil	None	Lag 1 (positive)***	None	Lag 1 (positive)***
China	None	Lag 1 (positive)*	None	Lag 1 (positive)*
Germany	None	Lag 1,2 (positive)***	Lag 1 (positive)*	Lag 1 (positive)*
Greece	None	Lag 1 (positive)**	None	None
Japan	None	Lag 3 (positive)**	Lag 3 (positive)*	None
Korea	Lag 1 (negative)*	None	Lag 1 (negative)*	None
Mexico	None	Lag 1 (positive)***	None	Lag 1 (positive)***
Spain	None	Lag 1 (positive)***	None	Lag 1 (positive)**
Thailand	None	None	None	None
Turkey	None	None	None	None
UK	None	Lag 1 (positive)***	None	Lag 1 (positive)***
USA	None	Lag 1 (positive)***	None	Lag 1 (positive)***

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 13: Granger-causality F-statistics for the BCI VAR model: Equation 1 and Equation 2

BCI VAR model	Apr 1995 – Sep 2013 F-statistic Equation 1 (Null hypothesis: Business confidence does not Granger-cause stock returns)	Apr 1995 – Sep 2013 F-statistic Equation 2 (Null hypothesis: Stock returns do not Granger-cause business confidence)	Full series F-statistic Equation 1 (Null hypothesis: Business confidence does not Granger-cause stock returns)	Full series F-statistic Equation 2 (Null hypothesis: Stock returns do not Granger-cause business confidence)
Brazil	0.16 (0.69)	14.6*** (0.00017)	0.16 (0.69)	14.6*** (0.00017)
China	0.01 (0.9)	5.22* (0.024)	0.01 (0.9)	5.22* (0.024)
Germany	5.03** (0.0074)	3.81* (0.024)	4.87** (0.0082)	2.8 (0.062)
Greece	0.01 (0.92)	9.7** (0.0021)	0.07 (0.8)	3.22 (0.074)
Japan	2.17 (0.092)	5.46** (0.0012)	2.16 (0.052)	3.77* (0.011)
Korea	4.44* (0.036)	2.56 (0.11)	6.36* (0.012)	2.28 (0.13)
Mexico	2.02 (0.16)	16.9*** (6e-05)	2.02 (0.16)	16.9*** (6e-05)
Spain	0.01 (0.92)	12.1*** (6e-04)	0.15 (0.7)	9.89** (0.0018)
Thailand	1.36 (0.24)	1.3 (0.26)	1.36 (0.24)	1.3 (0.26)
Turkey	0.83 (0.36)	0.04 (0.84)	1.7 (0.19)	0.03 (0.86)
UK	0.08 (0.77)	15.8*** (9.6e-05)	2.74 (0.099)	13.8*** (0.00024)
USA	0.33 (0.57)	21.2*** (7.2e-06)	0.4 (0.53)	19.6*** (1.2e-05)

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

Table 14: Summary of results from the selected data analysis

	CCI → Stock	Stock → CCI	Stock ↔ CCI	CCI and Stock Independent
BCI → Stock		Korea		
Stock → BCI	Japan	Greece Spain USA China	Brazil UK	Mexico
Stock ↔ BCI		Germany		
BCI and Stock Independent		Turkey		Thailand

Appendix A

Table 1: Significant lags in the CCI VAR model: Equation I & II

CCI VAR model	Apr 2001 – Sep 2013		Full series	
	Equation 1 (Y variable: Stock index → Null hypothesis: Consumer confidence index does not have an impact on stock index)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock index does not have an impact on consumer confidence index)	Equation 1 (Y variable: Stock index → Null hypothesis: Consumer confidence index does not have an impact on stock index)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock index does not have an impact on consumer confidence index)
	Significant coefficients	Significant coefficients	Significant coefficients	Significant coefficients
	Confidence index*	Stock index*	Confidence index*	Stock index*
Germany	None	Lag 1 (positive)**	None^{++}	Lag 1^{++} (positive)***

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**
$^{++}$ indicates the CCI is not stationary; therefore, the results are from the first-differenced data

Table 2: Granger-causality F-statistics for the CCI VAR model: Equation I & II

CCI VAR model	Apr 2001 – Sep 2013 F-statistic		Full series F-statistic	
	Equation 1 (Null hypothesis: Consumer confidence Granger-cause stock index)	Equation 2 (Null hypothesis: Stock index Granger-cause consumer confidence)	Equation 1 (Null hypothesis: Consumer confidence Granger-cause stock index)	Equation 2 (Null hypothesis: Stock index Granger-cause consumer confidence)
Germany	2.4 (0.12)	10.1** (0.0018)	1.14^{++} (0.29)	35***$^{++}$ (6.2e-09)

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**
$^{++}$ indicates the CCI is not stationary; therefore, the results are from the first-differenced data

Appendix B

Table 1: Significant lags in the BCI VAR model: Equation III & IV

BCI VAR model	Apr 1995 – Sep 2013		Full series	
	Equation 1 (Y variable: Stock index → Null hypothesis: Business confidence index does not have an impact on stock index)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock index does not have an impact on Business confidence index)	Equation 1 (Y variable: Stock index → Null hypothesis: Business confidence index does not have an impact on stock index)	Equation 2 (Y variable: Confidence index → Null hypothesis: Stock index does not have an impact on Business confidence index)
	Significant coefficients	Significant coefficients	Significant coefficients	Significant coefficients
	Confidence index*	Stock index*	Confidence index*	Stock index*
Brazil	None	Lag 1, 2 (positive)***	None	Lag 1, 2 (positive)***
Germany	None	Lag 1 (positive)***	None	Lag 1 (positive)*
Turkey	None	None	None	None
UK	None	Lag 1 (positive)***	None	Lag 1 (positive)***
USA	None^{++}	Lag 1^{++} (positive)***	None	Lag 1 (positive)***

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

$^{++}$ indicates the BCI is not stationary; therefore, the results are from the first-differenced data

Table 2: Granger-causality F-statistics for the BCI VAR model: Equation III & IV

	Apr 1995 – Sep 2013 F-statistic		Full series F-statistic	
BCI VAR model	Equation 1 (Null hypothesis: Business confidence Granger-cause stock index)	Equation 2 (Null hypothesis: Stock index Granger-cause business confidence)	Equation 1 (Null hypothesis: Business confidence Granger-cause stock index)	Equation 2 (Null hypothesis: Stock index Granger-cause business confidence)
Brazil	0.32 (0.79)	12.2*** (0.00005)	0.32 (0.72)	12.2*** (1e-05)
Germany	3.2* (0.024)	4.01** (0.0084)	2.86** (0.037)	2.75* (0.048)
Turkey	0 (0.96)	0.5 (0.48)	0.08 (0.77)	1.13 (0.29)
UK	0.39 (0.53)	11.8*** (0.00073)	0.08 (0.77)	12.2*** (0.00055)
USA	0.92++ (0.34)	27.2***++ (4.3e-07)	1.7 (0.19)	20.7*** (6.7e-06)

Significant codes: 0 '*' 0.001 '**' 0.01 '*' 0.05**

++ indicates the BCI is not stationary; therefore, the results are from the first-differenced data

Appendix C

Diagnostics: Johansen cointegration tests for stock prices and the CCI

	Null hypothesis: No cointegration	Maximum eigenvalue statistic	
	Country	Apr 2001 – Sep 2013	Full series
1	Brazil	8.53	16.73
2	China	11.13	10.56
3	Germany	8.32	CCI stationary
4	Greece	7.01	10.45
5	Japan	15.00	14.20
6	Korea	15.21	16.18
7	Mexico	6.58	6.58
8	Spain	9.35	8.15
9	Thailand	7.17	6.79
10	Turkey	10.70	10.70
11	UK	6.77	12.89
12	USA	10.55	18.19
	1% Critical value	20.20	20.20

*** indicates maximum eigenvalue statistic above the critical value**

Appendix D

Diagnostics: Johansen cointegration tests for stock prices and the BCI

	Null hypothesis: No cointegration	Maximum eigenvalue statistic	
	Country	Apr 1995 – Sep 2013	Full series
1	Brazil	BCI stationary	BCI stationary
2	China	31.08*	31.08*
3	Germany	BCI stationary	BCI stationary
4	Greece	5.78	10.14
5	Japan	8.40	10.66
6	Korea	14.86	16.67
7	Mexico	11.71	11.71
8	Spain	8.06	6.36
9	Thailand	13.38	13.38
10	Turkey	BCI stationary	BCI stationary
11	UK	BCI stationary	BCI stationary
12	USA	18.44	BCI stationary
	1 % Critical value	20.20	20.20

*** indicates maximum eigenvalue statistic above the critical value**

Appendix E

CCI Analysis	Methodology	Studied countries	Previous studies' results	This paper's results
Otoo (1999), Bremmer (2008)	VAR and Granger-causality	USA	Stock → CCI	Same
Maik Schmeling (2009)	Panel regression ($Stock_{t+k} \sim CCI_t$ + aditional macroeconomics $variables_t$)	Jointly 18 industrialized countries	CCI → Stock	
Fisher and Statman (2000) (1977-2000)	OLS ($Stock_t \sim CCI_{t-1}$)	USA	CCI (Conference Board) → Stock returns	
Jansen and Nahuis (2003) (1986-2001)	VAR and Granger-causality (2 weeks)	Germany (DAX)	Independent	Stock → CCI (2001-2013)
		Greece (Athens Composite)	Independent	Stock → CCI (2001-2013)
		Spain (Madrid SE)	Stock → CCI	Same
		UK (FTSE100)	Stock → CCI	Bidirectional (2001-2013) Same (full data)
		Belgium, Denmark, Ireland, Italy, Netherland	Stock → CCI	
		Portugal	Independent	
		France	CCI → Stock	
This paper (2001-2013)	VAR and Granger-causality	China, Korea, Turkey		Stock → CCI
		Japan		CCI → Stock
		Mexico, Thailand		Independent
		Brazil		Bidirectional

Appendix F

BCI Analysis	Methodology	Studied countries	Previous studies' results	This paper's results
Collins (2001)	VAR and Granger-causality	USA (1954-2001) S&P 500	Stock → BCI	Same
		Germany (1970-2000) DAX	Stock → BCI	Bidirectional Same (full data)
		Japan (1974-2000) Nikkei 225	Stock → BCI	Same
		South Africa (1976-2000)	Stock → BCI	
Atukeren, Korkmaz, and Çevik (2012) (1988-2010)	Causality-in-mean	Greece (All shares)	Independent	Stock → BCI Same (full data)
		Spain (All shares)	Stock → BCI	Same
This paper (1995-2013)	VAR and Granger-causality	Thailand, Turkey		Independent
		Korea		BCI → Stock
		Brazil, China, Mexico, UK,		Stock → BCI