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Stock market, banking sector and economic growth

A cross-country analysis over different economic cycles

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Abstract

Purpose – The purpose of this paper is to examine the causal relationship between economic development and financial sector development for 28 countries at different stages of their development. The authors specifically focus on the nature of causality during economic boom and tranquil cycles.

Design/methodology/approach – The study uses quarterly time series panels of 17 developed and 11 emerging countries, during 1993Q1-2014Q4 with each having three sub-panels – full sample, a period of the economic uptrend (UP), and period of the economic downtrend. The authors use a univariate analysis for initial screening followed by panel unit root test, panel co-integration and causality test proposed by Toda–Yamamoto to examine the causal relationship.

Findings – The principal results suggest that for developed economies, there is a causal flow from financial sector to real sector in line with the "supply-leading" hypothesis, whereas for emerging economies, it is from real sector to financial sector, in line with the "demand-following" hypothesis. This overall relationship is strong for both emerging and developed economies during economic boom or UP cycles, but becomes weak during economic downturns or tranquil periods.

Originality/value – This study is different from previous studies on this issue and contributes to the existing literature in a number of ways. First, the focus of this paper revolves around identification of differential patterns in causal flows between real and financial sectors for different economies, across different economic cycles. Second, to present a robust representation of financial sector, the authors consider both banking sector and stock market parameters as the proxy for financial sector development. Third, the authors address the "stock-flow problem" in the measurement of financial variables a typical criticism of some of the previous studies. Finally, the authors use a rich sample size comprising of about 2,500 quarterly observations for each variable, with about 1,500 observations from developed and 1,000 from emerging economies.

Keywords Economic development, Panel co-integration, Stock market, Banking sector development, Toda and Yamamoto causality test

Paper type Research paper

1. Introduction

This paper examines the causal relationship between economic growth and financial sector (stock market and banking sector) development over economic boom and tranquil cycles. In particular, we try and answer the following questions: Is there a causal relation between economic growth and financial development of a country? Is the relation bi-directional? or is it in line with the "supply leading" or the "demand following" hypothesis? Is the nature of

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this relation similar or different for countries at different stages of development? Is the relationship different across different economic cycles? Using quarterly time series data of several variables pertaining to economic growth and financial sector development from 28 countries representing emerging and developed economies and a series of univariate, multivariate and causality tests, we provide interesting insights into these issues.

Research on association between financial development and economic growth dates back to as early as twentieth century (Schumpeter, 1911) and is of great interest among economists for many years. A large amount of empirical research explores the impact of financial development on economic growth and vice-versa (King and Levine, 1993a, 1993b; Levine and Zervos, 1998; Levine *et al.*, 2000; Beck *et al.*, 2000; Beck and Levine, 2004). Results from these studies are generally conflicting in nature (Nyasha and Odhiambo, 2015).

Possible directions of causality between financial sector development and economic growth are highlighted by Patrick (1966) in his "supply-leading" and "demand-following" hypotheses. The "demand-following" hypothesis claims that when an economy grows, it creates increased demand for financial services, which, in turn, leads to development of financial sector. According to this view, lack of financial institutions in some countries at a lower level of economic growth, is simply the manifestation of lack of demand for their services. A few studies validate this hypothesis although they are few and sparse in time. Robinson (1952), Gurley and Shaw (1967), Goldsmith (1969) and Jung (1986) are to name a few.

The "supply-leading" hypothesis, on the contrary, claims that a causal relationship flows from financial sector development to economic development. As per this hypothesis, the intention to create and develop financial institutions and markets leads to increase in the supply of financial resources, which, in turn, fuels economic growth. This hypothesis has received overwhelming support in the empirical literature, particularly in the context of developed and industrialized economies. King and Levine (1993a, 1993b), Levine and Zervos (1998), Demirgüç-Kunt and Maksimovic (1996), Rajan and Zingales (1998), Levine *et al.* (2000), Beck and Levine (2004) and Laopodis and Papastamou (2016) report positive causal effects of financial development on economic growth in line with this hypothesis. These studies claim that countries with developed financial systems, large efficient banks and a well-organized and smoothly functioning stock market, tend to grow much faster by providing access to much-needed funds for financially constrained economic enterprises. More specifically, on this issue a large number of studies also indicate the presence of a "nonlinear" relationship between financial sector development and economic growth (Deidda and Fattouh, 2002; Rioja and Valev, 2004a, 2004b; Shen and Lee, 2006; Ergungor, 2008; Huang and Lin,2009; Arcand *et al.*, 2012). These studies posit that financial sector development is a significant determinant of economic growth in high-income countries but insignificant in low-income countries. This view is however challenged (Fry, 1995), which argue that countries in their early stage of development should benefit more from financial sector development.

In addition to providing empirical support for the "demand following" and the "supply leading" hypothesis, a number of empirical studies also report the presence of a two-way causality between financial development and economic growth (Atje and Jovanovic,1993; Demetriades and Hussein, 1996; Goldsmith, 1969; King and Levine, 1993a, 1993b; Levine and Zervos, 1998).

The growing importance of financial sector globally, especially in emerging countries, over the past few decades makes the issue particularly interesting because of obvious policy implications. In recent times, some research has been done with regard to this important question in emerging countries. Masoud and Hardaker (2012) analyse the relationship between economic growth and financial development by taking 42 emerging markets over 12 years period and find that the stock market development has a significant effect on

economic growth even after control for the influence of banking sectors. Sehrawat and Giri (2015, 2016) finds long-run relationship between financial development and economic growth for India and the SAARC countries, respectively and provides evidence for the "supply-leading hypothesis." Hsueh *et al.* (2013) studying ten Asian countries, Naik and Padhi (2015) covering 27 emerging economies report similar results. Banya and Biekpe (2017) report positive linkages between economic growth and banking competition for the frontier African nations. Kandil *et al.* (2017) compared China and India in terms of globalization, financial development and economic growth and finds that while globalization accelerates economic growth in India it impairs in case of China. Regarding capitalization and growth both the economies provide positive relationship. Kaushal and Ghosh (2018) study the role of financial intermediaries in economic development for India claiming that banking and insurance sector specifically play important role in economic growth in the long run. On the other hand, Habibullah (1999) and Chang (2002) for China and Bhattacharya and Sivasubramanian (2003), Agrawalla and Tuteja (2008), Sarkar (2007), Chakraborty (2008) and Deb and Mukherjee (2008) for India, Law and Singh (2014) for 87 developed and developing nations, Phiri (2015) for South Africa and Hamadi and Bassil (2015) for MENA region provide mixed results on the linkages between financial sector development and economic development over the past two decades.

Our study differs from many previous studies on this issue and contributes to the existing literature in a number of ways. First, a fundamental question, which remains unanswered so far is whether the nature of association between financial sector development and economic development is stable across time or varying across different economic growth cycles, namely, the boom and tranquil periods. A large number of previous studies (Deidda and Fattouh, 2002; Shen and Lee, 2006; Ergungor, 2008; Huang and Lin, 2009; Arcand *et al.*, 2012) posit that financial sector development is an important determinant of economic growth in high-income countries but insignificant in low-income countries suggesting that the nature of association can also be different in different economic cycles. The degree of such variation can again be different in emerging countries *vis-a-vis* developed ones. This issue, to the best of our knowledge has not been adequately addressed in previous research, particularly for emerging countries. The primary focus of this paper is to identify such differential patterns, if any, across boom and tranquil cycles for different countries. Second, although a majority of the previous studies focus on either banking sector parameters (Wu *et al.*, 2010; Chaiechi, 2012; Bojanic, 2012; Hsueh *et al.*, 2013; Menyah *et al.*, 2014; Pradhan *et al.*, 2014) or stock market parameters (Leon and Filis, 2008; Hasan *et al.*, 2009; Campos *et al.*, 2012) as proxy for financial sector development, very few have considered both, the most recent one being Vardar and Coskun (2016). To strengthen the literature, we consider both proxies and present a more robust representation of financial sector development. Having done that, the possibility of the problem of multicollinearity between banking and stock market variables cannot be ignored. Hence, we check possibility of multicollinearity through VIF test and find the test statistic value well within the acceptable range. Third, following Levine *et al.* (2000) and Calderón and Liu (2003), we address the "stock-flow problem"[1] in measurement of financial variables. We consider first difference of the financial sector variables in year t and t-1 in terms of percentage change of each variable and deflate end-of-year items by their corresponding end-of-year consumer price indices. We use a rich data set with representations from both developed and emerging economies. We use 88 quarterly observations of all variables spread over 22 years (1993Q1-2014Q4) for 28 countries: 17 developed countries and 11 emerging countries. This generates a total of about 2,500 quarterly observations for each variable overall, with about 1,500 observations from developed countries and 1,000 from emerging countries.

The study uses a combination of univariate analysis, panel unit root test, panel co-integration and causality test of Toda and Yamamoto (1995) (Toda–Yamamoto [TY] henceforth) under conditions of non-stationarity to test the nature of the association between financial sector development and economic growth. Our principal results are as follows: first, for developed countries, there seems to be a causal flow from financial to economic development, in line with the "supply-leading hypothesis." Second, for emerging countries, the direction of this causality reverses. We find strong causal flow from the real sector (economic development) to the financial sector, i.e. the "demand-following hypothesis" seems to be working for emerging economies. This is in sharp contrast with results suggested by some earlier studies. Third, although this overall relationship holds strong for both emerging and developed countries during economic booms or UP cycles, the pattern turns weak without any prominent direction during economic downturns or tranquil periods.

The remaining part of the paper is organized as follows: Section 2 discusses the variables used and sources of data, Section 3 details the methodology adopted, Section 4 presents the principal results obtained and inferences thereon. Section 5 furnishes the conclusion followed by references, appendices and tables.

2. Variables and data

Our analysis uses quarterly time series data for 17 developed countries and 11 emerging countries during 1993-2014. We classify developed and emerging countries using Morgan Stanley Capital International country index. We consider only those countries, which had continuous data for all the variables for the entire study period. Accordingly, our final sample has 17 developed and 11 emerging countries each having data over 88 quarters for all the variables. The countries in our sample is listed in Table I.

	List of emerging countries		List of developed countries
1	Chile	1	Australia
2	China	2	Austria
3	Greece	3	Belgium
4	Hungary	4	Canada
5	India	5	Finland
6	Indonesia	6	France
7	Malaysia	7	Hong Kong
8	Mexico	8	Israel
9	Philippines	9	Italy
10	South Korea	10	The Netherlands
11	Turkey	11	New Zealand
		12	Norway
		13	Singapore
		14	Spain
		15	Switzerland
		16	UK
		17	USA

Notes: This table shows the list of countries in our sample from developed and emerging economies. We consider the country classification used in Morgan Stanley Capital International country index. From the overall list, we consider only those countries, which had continuous data for all the variables mentioned in this section for the entire study period
Source: www.msci.com/market-classification

Table I.
List of countries

We collect data from two main sources, namely:

(1) Economist-Intelligence-Unit (EIU) database of Alacra; and

(2) Thomson Reuters.

The variables used in this study are selected primarily for their suitability as measures of the stock market, banking sector and economic development.

2.1 Economic development measures

Economic development is measured by quarterly change in real GDP (GPDCHNG) for each country. We collect this data for 1993-2014 and estimate the percentage change of the same over 88 quarters.

2.2 Financial sector development measures

We use both stock market and banking sector-related variables to represent financial sector development.

2.2.1 Stock market development measures. In this paper, we use the following variables as measures of stock market development:

- *Market capitalization* (MKTCAP): is used as a measure of the importance of equity markets in mobilizing capital and allocating resources (Rousseau and Wachtel, 2000). It is estimated as the product of share price and the number of shares outstanding for all the stocks traded on the principal exchange(s) of a given country.
- *Total value traded or trading volume* (TRDVOL): is used as a measure of liquidity in line with prior studies (Rousseau and Wachtel, 2000; Naceur and Ghazouani, 2007). It is estimated as the product of market price and the number of shares traded and reflects both liquidity and size of equity markets in a particular country. Rousseau and Wachtel (2000) posit that liquidity as a measure of stock market development is particularly important, as it raises the confidence of both individual and portfolio investors and facilitates the transfer of surpluses to deficient sectors in an economy and promotes development.
- *Stock market volatility* (SDMA): is estimated by the four-quarter moving standard deviation of the end-of-quarter change in the stock market index of individual countries and is used as a measure of efficiency in the allocation of investment resources in equity markets in line with some previous studies (Arestis *et al.*, 2001).

2.2.2 Banking sector development measures. Traditional intermediaries such as banks also play a very important role in placing of resources with participants in the real sector. For this reason, we believe that any examination of financial sector effects on growth should simultaneously consider the impact of the banking sector on growth. We use the following banking sector variables as proxies for financial sector development:

- *Total assets of banks* (BNKASSET): as a measure of the size of the banking sector (DeGregorio and Guidotti, 1995; Beck and Levine, 2004).
- *The stock of total domestic credit* (SDC): as a measure of liquidity and the size (Beck and Levine, 2004; Naceur and Ghazouani, 2007).
- *Total money supply* (M2): near money component of total money supply as a measure of liquidity. (Rousseau and Wachtel, 2000; Cheng, 2012). As mentioned in the preceding section, we adjust the data for all variables pertaining to both stock market and banking sector development for inflation. This is to bring the financial

sector data in sync with our real GDP change data. To overcome the potential non-stationarity problem associated with time series data of each of these variables we consider their first difference or "percentage change" form. Quarterly values of percentage change of all the variables between 1993 and 2014 are estimated from level data collected from (Table II).

3. Methodology

3.1 Identifying different economic cycles

We have already mentioned in Section 1 that the key objective of this study is to ascertain whether causal relationship between economic development and financial sector development is similar across different economic cycles, namely, booms and recessions. To identify boom or a period of the economic uptrend ("UP") cycles, we first sort quarterly real GDP growth numbers of each country in ascending order (total 88 quarters for each country). We then divide this data into three partitions: top 40 per cent growth quarters, median 20 per cent growth quarters and bottom 40 per cent growth quarters. We arrange data for all other variables corresponding to these sorted GDP values. The top 40 per cent values clubbed together correspond to UP or boom cycle while the bottom 40 per cent to be corresponding to a period of the economic downtrend (DOWN) or tranquil cycle.

3.2 Preliminary exploration: univariate analysis

We use univariate analysis approach as a preliminary check, to see if there exists a linear association between, financial sector variables and economic development. In this approach, we first sort the entire data of each country in descending order of GDP growth and then

Variable category	Variable	Definition	Symbol used in text	Source
Economic development	Change in real GDP	Percentage change in real GDP from one quarter to the next quarter	GDPCHNG	EIU Data Services
Stock market development	Change in market capitalization	Percentage change in market capitalization	MKTCAP	Thomson Reuters
. . .. Do. . ..	Change in trading volume	Percentage change in total trading volume	TRDVOL	Thomson Reuters
. . .. Do. . ..	Market volatility	Last four quarter moving average standard deviation of broad-based market indices	SDMA	Thomson Reuters
Banking sector development	Change in bank assets	Percentage change in total assets with BIS reporting banks	BNKASSET	EIU Data Services
. . .. Do. . ..	Change in domestic credit	Percentage change of stock of total domestic credit	SDC	EIU Data Services
. . .. Do. . ..	Change in near money component of total money supply	Percentage change of near money component of total money supply	M2	EIU Data Services

Note: This table shows the list of variables used in the study as indicators of economic development, stock market development and banking sector development with their definitions and the respective source of information

Table II. Definitions and sources of variables used

divide it into five quintiles Q1, Q2, Q3, Q4, Q5 (Q1 being the quarters with the highest GDP growth and Q5 the lowest). For each quintile, we then find the mean of the financial-sector variables. An increasing or decreasing trend in the financial sector variables across the quintiles would indicate a positive or negative association with GDP growth respectively giving a preliminary indication of any possible association between economic and financial sector development. We do this for the full sample (all 28 countries), developed countries (17 nos) and emerging countries (11 nos) separately. We repeat the same for the full period (88 quarters) and sub-samples based on economic UP and DOWN cycles separately – Table III shows the results of the univariate analysis. We discuss the results in greater detail in the next section.

	All countries					Developed countries					Emerging countries				
Variables	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
GDP	2,854.70	38.35	15.71	6.65	3.03	939.34	38.65	16.46	8.23	4.25	5,832.33	42.34	13.69	4.27	2.23
MKTCAP															
FS	275.35	74.92	34.16	28.21	8.84	429.44	86.40	45.06	30.74	22.90	53.83	40.51	15.18	11.84	3.18
Up	270.27	80.04	36.53	31.14	10.56	418.26	93.65	48.39	32.39	26.49	53.70	46.08	16.23	13.94	3.95
Down	290.75	74.10	32.54	28.61	9.40	454.97	81.71	42.58	31.74	22.96	58.16	41.86	13.63	11.70	3.14
TRDVOL															
FS	313.54	19.94	10.69	13.93	7.42	70.88	23.26	5.59	8.63	16.31	690.87	15.00	20.30	10.44	3.69
Up	380.38	21.56	13.72	14.12	9.34	61.76	24.66	6.28	9.40	18.00	877.68	11.78	26.04	11.87	4.79
Down	247.74	20.44	8.91	13.36	7.62	85.36	22.09	5.37	8.85	15.79	497.23	19.34	15.66	9.83	4.20
SDMA															
FS	0.11	0.09	0.10	0.09	0.12	0.06	0.08	0.08	0.08	0.11	0.17	0.12	0.14	0.11	0.13
Up	0.09	0.10	0.11	0.10	0.12	0.06	0.08	0.08	0.09	0.11	0.13	0.13	0.16	0.10	0.13
Down	0.12	0.09	0.09	0.09	0.12	0.07	0.07	0.08	0.08	0.11	0.21	0.12	0.12	0.11	0.13
BNKASSET															
FS	121.02	45.62	29.00	15.73	7.59	201.72	56.36	39.04	22.65	16.23	14.44	10.31	8.05	3.60	2.31
Up	114.13	48.51	32.36	17.12	8.14	189.73	60.88	45.85	23.72	16.66	13.93	10.60	8.20	4.60	2.77
Down	132.50	42.74	28.17	16.23	7.61	220.82	51.56	37.77	22.37	16.00	14.28	11.12	8.09	3.82	2.53
SDC															
FS	3.34	17.15	30.99	2.77	1.97	4.71	0.17	0.11	2.15	3.15	1.16	43.74	80.01	1.90	0.93
Up	3.33	15.70	30.99	1.79	2.33	4.80	0.17	0.10	1.23	3.55	1.01	39.84	78.69	1.96	1.13
Down	3.52	18.71	31.30	3.09	2.04	4.88	0.17	0.11	2.45	3.19	1.34	47.52	80.97	1.85	1.06
M2															
FS	1.85	13.91	29.21	3.63	2.32	2.00	0.09	0.06	3.02	4.76	1.42	34.70	74.92	1.42	0.66
Up	1.71	12.70	29.99	2.52	2.81	1.90	0.09	0.06	1.78	5.52	1.26	31.71	75.44	1.49	0.80
Down	2.00	15.37	28.59	3.91	2.35	2.09	0.09	0.07	3.26	4.69	1.65	37.78	73.77	1.39	0.74

Notes: The table reports the means of the univariate analysis conducted on panels of: all countries, developed countries and emerging countries. Further, each of the panels comprises of three sub-panels, namely, full sample (FS), period of economic uptrend (UP) and period of economic downtrend (DOWN). The respective sample length is first sorted from largest to smallest basis, divided into five quintiles, namely, (Q1, Q2, Q3, Q4, Q5) and their respective average is derived; The analysis gives us an initial idea about probable existence of association between variables pertaining to economic development (i.e. GDPCHNG) and financial development i.e. stock market variables (MKTCAP, TRDVOL, SDMA) and the banking sector variables (BNKASSET, SDC, M2). It is observed from the table that at several panels the variables displays the above mentioned linear relationship, giving us evidence to study further

Table III.
Univariate analysis

3.3 Checking stationarity: panel unit root test

Typically, stationarity testing approaches such as the augmented Dickey–Fuller (ADF) tests are adequate for strictly time series data for individual cross sectional units. However, in this study, most of our analysis will be on panel or pooled data, and hence, to avoid problems of limited size and power properties of conventional ADF tests under panel scenario (Breitung, 2000; Hlouskova and Wagner, 2005); we use panel unit root tests of Levin *et al.* (2002), (LLC henceforth) and Im *et al.* (2003), (IPS henceforth). LLC test is designed on the principles of ADF test but it allows for heterogeneity of the intercepts across panel members. The model allows for fixed-effects, unit-specific time trends and common time effects. The coefficient $\theta_L$of lagged dependent variable is restricted to be homogenous across all units of the panel. In this test, $i = 1, 2. \ldots \ldots., N$ represents the country in the panel, $t = 1, 2. \ldots \ldots., T$ represents the year in the panel, $m = 1, 2, 3$ indexes the case considered, y_{it} is the series for country i in the year t and the ADF for each cross-section is estimated through the following equation:

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{L=1}^{p_i} \theta_{iL} \Delta y_{i,t-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \quad (1)$$

where p_i is the number of lags required for conducting ADF regression. Then, to obtain the residual $\hat{e}_{it}$ and $\hat{v}_{it-1}$, the following regressions are conducted: Δy_{it} on $\Delta y_{i,t-L}$ and d_{mt} to get the residual $\hat{e}_{it}$ and $y_{i,t-1}$ on $y_{i,t-L}$ and d_{mt} to obtain residuals $\hat{v}_{it-1}$, standardization of the residuals is done through: $\tilde{e}_{it} = \hat{e}_{it}/\hat{\sigma}_{\varepsilon_i}$; $\tilde{v}_{it-1} = \hat{v}_{it}/\hat{\sigma}_{\varepsilon_i}$. Finally, a pooled ordinary least square regression is done through the following equation $\tilde{e}_{it} = \rho \tilde{v}_{it-1} + \tilde{\varepsilon}_{it}$. Thus, the null hypothesis is $\rho = 0$ and a non-stationary panel. A non-zero ρ implies rejection of the null.

As the LLC test is too restrictive with a the null hypothesis that all cross-sections have a unit root, we also conduct IPS Test, as it allows individual unit root processes to vary across cross-sections. We do not report the results separately for the sake of brevity, but they are in line with LLC test results. Table IV shows the results of panel unit root tests, which shows all variable series being considered for analysis here are *I(1)* i.e. integrated of order 1. This typically serves as a suitable pre-requisite for panel-co integration test and negates the possibility of carrying out standard pair-wise Granger causality tests. We next proceed with panel co-integration tests to explore long term equilibrium relation between chosen variables under study and follow it up with advanced causality tests of TY, which are adopted under conditions of non-stationarity.

3.4 Panel co-integration test

A co-integration test is used to check the presence of a long-run equilibrium relationship among variables. Lack of co-integration typically suggests the absence of any association between variables under study and there is a possibility of them drifting away from each other in the long run. So, having tested the variables for the order of stationarity, we test for a possible long-run equilibrium relationship using Kao (1999) and Pedroni (2004) panel co-integration test. Pedroni (1999, 2004) provides seven different residual-based panel co-integration tests for testing the null hypothesis of no co-integration. (*Ho: $\rho i = 1$, for all i =* $1, \ldots \ldots., N$). However, the alternative hypothesis for four within-dimension-based statistics (i.e. Panel v, Panel rho, Panel PP and Panel ADF) is *H1: $\rho i = \rho < 1$, for all i* $= 1, \ldots, N$; whereas for three between-dimension-based statistics (i.e. Group rho, Group PP and Group ADF) the alternative hypothesis is *H1: $\rho i < 1$, for all i* $= 1, \ldots \ldots, N$. Kao (1999) provided the parametric residual-based panel co-integration for the null hypothesis of no co-integration.

Variables	Sample	All countries LLC - STAT LE	FD	Inference	Developed countries LLC - STAT LE	FD	Inference	Emerging countries LLC - STAT LE	FD	Inference
GDP		1.43	−28.99*	I(1)	1.22	−24.32*	I(1)	0.93	−15.89*	I(1)
MKTCAP	FS	−0.05	−2.48*	I(1)	−0.40	−37.32*	I(1)	1.24	−6.03*	I(1)
	Up	−0.93	−41.74*	I(1)	−0.33	−30.90*	I(1)	−0.02	−4.31*	I(1)
	Down	−0.16	−1.79**	I(1)	−1.25	−27.29*	I(1)	−0.11	−5.20*	I(1)
TRDVOL	FS	3.00	−53.82*	I(1)	2.76	−41.34*	I(1)	1.19	−34.55*	I(1)
	Up	3.82	−36.78*	I(1)	3.65	−30.15*	I(1)	2.96	−21.13*	I(1)
	Down	1.44	−2.67*	I(1)	1.23	−1.94**	I(1)	1.11	−2.03*	I(1)
SDMA	FS	−0.07	−9.23*	I(1)	−0.06	−6.92*	I(1)	−0.02	−6.11*	I(1)
	Up	−0.05	−3.28*	I(1)	−0.02	−3.29*	I(1)	−1.16	−21.01*	I(1)
	Down	−0.30	−5.13*	I(1)	−0.25	−4.02*	I(1)	−0.14	−3.18*	I(1)
BNKASSET	FS	4.58	−29.25*	I(1)	3.98	−25.29*	I(1)	3.21	−15.73*	I(1)
	Up	2.56	−18.73*	I(1)	1.56	−14.18*	I(1)	1.22	−12.22*	I(1)
	Down	3.66	−26.53*	I(1)	3.27	−21.92*	I(1)	2.63	−15.19*	I(1)
SDC	FS	21.37	−8.68*	I(1)	14.38	−6.29*	I(1)	18.26	−6.48*	I(1)
	Up	−0.81	−38.12*	I(1)	−0.33	−30.44*	I(1)	−1.08	−23.22*	I(1)
	Down	−0.67	−1.31***	I(1)	−0.58	−1.26***	I(1)	−0.44	−24.04*	I(1)
M2	FS	2.58	−9.23*	I(1)	1.98	−8.20*	I(1)	1.44	−4.91*	I(1)
	Up	3.01	−10.17*	I(1)	3.02	−11.01*	I(1)	2.88	−3.38*	I(1)
	Down	4.01	−11.69*	I(1)	3.56	−10.32*	I(1)	1.62	−6.24*	I(1)

Notes: *; **; *** indicates statistical significance at 1, 5 and 10%. I(0) integrated at level, I(1) integrated at order 1.LE: indicates level data; FD: indicates first difference data. The test statistics are reported at no intercept and no trend; the table reports the results of Levin-Lin-Chu, LLC (2002) panel unit root tests for panels of: all countries, developed countries and emerging countries. Further, each of the panels comprises of three sub panels, namely, full sample (FS), period of economic uptrend (UP) and period of economic downtrend (DOWN). We also conduct the Im Pesaran and Smith, IPS (2003) test for panel unit root. For the sake of brevity, we do not report the results here. However, we may mention that the results are almost similar to the LLC tests

Table IV.
Results of the panel unit root test

3.5 Causality tests

Having tested the presence of long-run relationship through co-integration tests, we next ascertain the exact nature of the relation in terms of the direction of causal flows. As all series under consideration, are found to be *I(1)*, we use Toda and Yamamoto (1995) tests to test causal flow between financial sector development and economic development variables.

3.5.1 Toda and yamamoto test. Toda and Yamamoto (1995) propose an alternative causality test, which can be applied "whether the vector-autoregressive model's (VAR) may be stationary (around a deterministic trend), integrated of an arbitrary order or co-integrated of an arbitrary order." The testing procedure is similar to Granger causality, but augmented with extra lags depending on the maximum order of integration of the series under consideration. In this approach, if in a pairwise causality test, one or both the series are non-stationary we construct a VAR in their levels with a total of $(k + dmax)$ lags, where k is the optimal number of lagged terms included, which is determined by Akaike information criterion or Schwarz information criterion (SIC). Thus, if $k = 1$ and if two series y_t and x_t have different orders of integration, namely, I (0) and I (1), respectively so that d max = 1, then one extra lag is added to each variable. Thus, a VAR with two lags is constructed as follows:

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \beta_{11}^{(1)} & \beta_{12}^{(1)} \\ \beta_{21}^{(1)} & \beta_{22}^{(1)} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_{11}^{(2)} & \beta_{12}^{(2)} \\ \beta_{21}^{(2)} & \beta_{22}^{(2)} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (2)$$

A Wald test (also called the modified Wald or MWALD) is carried out to determine the relationship between two variables. The Wald statistic follows asymptotic χ^2 distribution and can be applied even if y_t and x_t are I (0), I (1) or I (2), non-cointegrated and/or the stability and rank conditions are not satisfied, provided "the order of integration of the process does not exceed the true lag length of the model" (Toda and Yamamoto, 1995).

4. Results and inferences

4.1 Results of univariate analysis

Table III shows the results of the univariate analysis and provides an initial idea of the probable existence of an association between variables pertaining to economic and financial development. We find strong evidence of a direct association between economic growth (GPDCHNG) and three financial sector variables; of these two are related to equity markets, namely, MKTCAP and TRDVOL and one to the banking sector, namely, BNKASSET. The association of GDPCHNG with the remaining three variables SDMA, SDC and M2 seems to be volatile and unclear. The pattern seems to hold across developed and emerging countries and UP-and-DOWN economic swings. This observation clearly confirms the possible association between economic and financial-sector development giving us evidence to study further.

4.2 Panel unit-root and panel co-integration test results

Table IV presents the results of panel unit root tests. The results show that the variables used is integrated at level (stationary) and of order one. We also conduct stationarity tests for the curtailed series representing UP and DOWN cycles. The results are more or less in line with those of stationarity tests for the full sample period. For brevity, we do not report them separately.

This leads us to examine the co-integration among them. The panel co-integration test results presented in Table V provide ample evidence of long-run relationship between the variables.

4.3 Causality test results

Table VI Panels A- C show the causality test results among variables pertaining to economic development (i.e. GDPCHNG) and financial development, i.e. stock market variables (MKTCAP, TRDVOL, SDMA) and the banking sector variables (BNKASSET, SDC, M2). The analysis is conducted on panels of all countries, developed and emerging, and further subpanels based on economic swings. 'Y', 'N' and 'U' in the table denote overall evidence of significant causality, no causality and unclear evidence of causality. This inference is based on the evidence of causality exhibited by a majority in the sample.

The results clearly indicate the following:

- For developed countries, there seems to be a causal flow from financial to economic sector, in line with the "supply leading hypothesis." This is evident from the number of countries registering causality from financial sector variables to economic development within broad category (12/17 for BNKASSET, 12/17 for SDC, 15/17 for M2, 12/17 for SDMA, 11/17 for MKTCAP and 13/17 for TRDVOL for the full period sample). Our findings are in line with Rajan and Zingales (1998), Levine *et al.* (2000)

Pedroni test	All countries FS	UP	DOWN	Developed countries FS	UP	DOWN	Emerging countries FS	Up	DOWN
Panel v-statistic	0.215	−2.12	−3.70	−2.17	5.34*	1.37**	0.97	10.94*	−3.71*
Panel rho-statistic	−24.04*	6.59	1.18	−10.62*	6.56	−0.71	−17.69*	7.02	1.182
Panel PP-statistic	−45.28*	10.22	−5.85*	−19.71*	10.17	−19.10*	−33.76*	13.63	−5.85
Panel ADF-statistic	−20.77*	11.53	−2.76	−16.77*	11.76	−19.91*	−12.91*	13.16	−2.76
Group rho-statistic	−17.05*	9.97	3.92	−10.65*	7.86	1.646	−13.93*	7.44	3.92
Group PP−statistic	−37.33*	14.53	−7.07*	−22.60*	9.53	−16.25*	−31.53*	12.14	−7.07
Group ADF-statistic	−21.09*	18.79	−2.20	−16.70*	9.39	−12.07*	−12.88*	12.54	−2.20
Kao test									
ADF (*t*-stat)	−0.78	6.7	−5.16	−2.72	2.26	−0.86	2.41	5.49	−3.19
Prob	0.21	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00

Notes: *Indicates statistical significance at 1%; ** significance at 5%; null hypothesis is no co-integration; Pedroni assumes a deterministic intercept and trend. Pedroni ADF has an automatic lag length selection using SIC. Newey–West automatic bandwidth selection and Bartlett kernel are used; Kao assumes an individual intercept and no deterministic trend. Kao's ADF has an automatic lag length selection using SIC; the table reports the results of Pedroni (1999, 2004) panel co-integration tests and Kao's (1999) ADF test for panels of: all countries, developed countries and emerging countries. Further each of the panels comprises of three sub-panels, namely, full sample (FS), period of economic uptrend (UP) and period of economic downtrend (DOWN)

Table V.
Results of the panel Co-integration test

Causality	All countries FS	UP	DOWN	Developed countries FS	UP	DOWN	Emerging countries FS	UP	DOWN
GDPCHNG TO BNKASSET	Y	Y	Y	U (8/17)	U(9/17)	N(5/17)	Y(9/11)	Y(9/11)	N(1/11)
BNKASSET TO GDPCHNG	Y	Y	N	Y (12/17)	Y(15/17)	N(4/17)	N(3/11)	N(3/11)	N(3/11)
GDPCHNG TO SDC	Y	Y	Y	N (7/17)	N(7/17)	N(3/17)	Y(7/11)	Y(7/11)	N(2/11)
SDC TO GDPCHNG	Y	Y	Y	Y (12/17)	Y(14/17)	N(2/17)	N(1/11)	N(1/11)	N(1/11)
GDPCHNG TO M2	Y	Y	Y	N (5/17)	N(5/17)	N(3/17)	Y(7/11)	Y(7/11)	N(1/11)
M2 TO GDPCHNG	Y	Y	Y	Y(15/17)	Y(15/17)	N(1/17)	N(1/11)	N(1/11)	N(1/11)
GDPCHNG TO SDMA	Y	Y	Y	N(5/17)	N(5/17)	N(2/17)	Y(9/11)	Y(9/11)	N(5/11)
SDMA TO GDPCHNG	N	N	Y	Y(12/17)	Y(12/17)	N(4/17)	N(2/11)	N(2/11)	N(5/11)
GDPCHNG TO MKTCAP	Y	Y	N	N(6/17)	N(7/17)	N(4/17)	Y(8/11)	Y(8/11)	N(2/11)
MKTCAP TO GDPCHNG	Y	Y	N	Y(11/17)	Y(12/17)	N(4/17)	N(2/11)	N(2/11)	N(1/11)
GDPCHNG TO TRDVOL	Y	Y	N	N(5/17)	N(7/17)	N(5/17)	N(4/11)	N(4/11)	N(1/11)
TRDVOL TO GDPCHNG	N	N	N	Y(13/17)	Y(13/17)	N(3/17)	N(3/11)	N(3/11)	N(0/11)

Notes: 'Y', 'N' and 'U' in the table denote overall evidence of significant causality, no causality and unclear evidence of causality. This inference is based on the evidence of causality exhibited by a majority in the sample. If a significant number of sample countries exhibit causality then we write 'Y', if not then 'N' and if it is somewhere around 50% we write 'U'. Out of 28 countries under study, 17 are developed countries and 11 are emerging countries. The notations given within ( ) shows the number of countries either developed or emerging, out of the sample showing evidence of causality; The table reports the causality test results between variables pertaining to economic development (i.e. GDPCHNG) and financial development i.e. stock market variables (MKTCAP, TRDVOL, SDMA) and the banking sector variables (BNKASSET, SDC, M2). The analysis is conducted on panels of all countries, developed countries and emerging countries. Further, each of the panels comprises of three sub-panels, namely, full sample (FS), period of economic uptrend (UP) and period of economic downtrend (DOWN)

Table VI.
TY granger causality test

and Beck and Levine (2004), who also suggest that in a well-developed market, more finance leads to more economic growth. Thus, for developed economies, financial development attracts more capital and raise national savings, thus, increasing both capital formation and growth. Better technological advancement and low information costs in these countries, also are probably instrumental in allocating savings more efficiently, finally leading to real sector or economic growth.

- For emerging economies, however, the direction of causality reverses. We find evidence of causal flow from the real (economic growth) to the financial sector in line with "demand following hypothesis." This is again evident from the number of countries registering causality from economic development to all financial sector variables (except TRDVOL) within the broad category (9/11 for BNKASSET, 7/11 for SDC, 7/11 for M2, 9/11 for SDMA and 8/11for MKTCAP for the full period sample). This shows that, for emerging economies, it is economic growth, which Granger causes financial development. In other words, it is growth in the real sector that induces expansion of financial system by stimulating active participation in the financial markets. This result, though contrary to a majority of studies, is consistent with Zang and Kim (2007) and Apergis *et al.* (2007). Although the present result does not quite imply that the role of financial development in the development process is not important for emerging economies, the bottom line is that there is a need for a more balanced approach to studying the relationship between growth and finance. Lucas (1988) considers the importance of financial development in economic growth badly "over-stressed."
- When all countries are considered together we also find mild evidence of bi-directional causality, i.e. financial depth stimulates growth and, simultaneously, growth propels financial development.
- The results for the UP cycles are almost exactly in line with the overall results but even stronger. When all countries are considered together we find mostly evidence of bi-directional causality. For pooled data of emerging countries, the causal flow is strong from economic growth to all financial sector variables (except TRDVOL), whereas there is strong evidence of causal flow from financial-sector variables to economic growth for developed countries.
- In economic DOWN cycles for pooled data of all countries, there is still some evidence of bi-directional causal flow between economic growth and financial-sector variables, albeit much weaker than in UP cycles or overall period. If we consider the developed or emerging countries separately, the relationship becomes weak and loses direction.

On the whole, our results indicate that for developed countries, there is a causal flow from financial-sector to economic development in line with the "supply-leading hypothesis," whereas for emerging countries, it is from economic to financial-sector development in line with "demand following hypothesis." This overall relationship is strong for both emerging and developed countries during economic boom or UP cycles but becomes weak during downturns.

5. Conclusion

This paper examines the causal relationship between economic growth and financial-sector (stock market and banking sector) development over economic boom and tranquil cycles. The debate is ongoing since the early twentieth century and a large amount of empirical

research exists to explore the issue (King and Levine, 1993a, 1993b; Levine, 1998, 2004; and Beck *et al.*, 2000, 2005). However, one fundamental question, which remains unanswered so far is whether the nature of association between financial-sector and economic development is stable across time or varying across different economic growth cycles. Conflicting results from previous works and this unanswered question motivates us to explore the issue further. Financial-sector development is an important determinant of economic growth in high-income countries but is insignificant in low-income countries (Deidda and Fattouh, 2002; Shen and Lee, 2006; Ergungor, 2008; Huang and Lin, 2009; Arcand *et al.*, 2012). The implication of this point can probably be extended and make us believe that the nature of association can be different in different economic cycles. To the best of our knowledge, the issue has not been adequately addressed in previous research so far, particularly for emerging economies. Thus, the main focus here is to identify such differential patterns, if any, across boom and tranquil cycles for different countries.

The study uses quarterly time series data of selected variables pertaining to economic growth and financial sector development spanning over 88 quarters from 1993 to 2014 of 11 emerging and 17 developed countries. We use techniques of panel unit root, panel co-integration and long-run causality test of Toda and Yamamoto (1995).

The primary results for developed countries suggest a causal flow from financial sector development to economic growth, in line with the "supply-leading hypothesis." This implies that for developed economies financial development attracts more capital and raises national savings, thus, increasing both capital formation and growth. Better technological advancement and low information costs in these countries are also probably instrumental in allocating savings more efficiently, finally leading to real sector or economic growth. These findings are in line with Rajan and Zingales (1998), Levine *et al.* (2000) and Beck and Levine (2004), who also suggest that in a well-developed market, more finance leads to more economic growth. For emerging economies, however, the direction of causality reverses. We find strong causal flow from the real sector (economic growth) to the financial sector, i.e. the "demand-following hypothesis" seems to be working for emerging economies. In other words, for emerging economies, growth in the real sector expand the financial system by stimulating demand of financial services. This result, though contrary to majority of studies, is consistent with Zang and Kim (2007) and Apergis *et al.* (2007). It does not quite imply that the financial sector is not important in development process for emerging economies, but probably indicates that a more balanced approach needs to be adopted to study such a relationship. Interestingly, this overall relationship seems to be primarily caused, by a very strong relationship along similar lines, both for emerging and developed countries during economic boom or UP-cycles. However, it becomes very weak and loses any prominent direction during economic downturns or tranquil periods. No discernible patterns are visible in the relationship during such periods. This is probably caused by loss of trust and significant reduction in volume of transaction across participants from the real and financial sectors.

These findings, we believe, can have significant implications for all stakeholders in the economy, especially policymakers as the direction of their major economic policies can be effectively guided by these findings.

Note

1. Financial intermediary balance sheet items are stocks measured at the end of the year while GDP is an average flow over the year.

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Further reading

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