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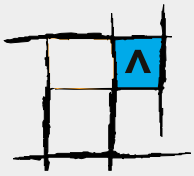

Balance Sheet Effects and Financial Propagation: Evidence from Industrial and Emerging Markets[1]

By

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Abstract

This paper examines the balance sheet effects with particular attention to the development of the financial system. Our results indicate that the macroeconomic cycles are more volatile in financially underdeveloped economies. We also found that net worth measured by stock prices plays a role in propagating real and credit cycles. The sensitivity to the change in net worth is particularly large in financially underdeveloped economies. Asymmetric behavior of the responses across boom and crash periods is found to be significant with production and credit cycles associated with the low level of financial development. This evidence supports the prediction of financial propagation mechanism caused by the balance sheet effects.

Key word: Financial propagation, Balance sheet effect, and Credit booms
JEL classification: F2, F4, E3

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I. Introduction

Following widespread financial deregulation and increased globalization of capital markets since the early 1980s, many countries have witnessed a clear upward trend in asset prices. Alongside this trend, stock, property, and land prices have undergone swings around typical business cycle frequencies of 44 months on average (Kaminsky and Schmukler (2000). Such swings have been quite pronounced. In some cases, such as Japan and Scandinavia during the late 1980s and early 1990s, these swings turn out to have far-reaching disruptive effects on domestic financial systems. They also contribute to credit crunch and prolonged recessions. Recent economic turmoil during Asian crisis starting in 1997 has also been dramatic and has defied expectations of policy and academic observers. As capital flow reversed, stock prices fell and currencies depreciated precipitously. Growth plummeted in all affected countries (as well as in other countries in the region), and external current accounts underwent abrupt swings. In several respects theses outturns were much worse than expected[2].

Many of the recent studies, which attempt to build a currency crisis model, have argued that the core of the problem lies in the banking system or the imperfect capital market. In a globally integrated environment with strong growth and large capital inflows, credit market effects can be more pronounced than in closed economies. Capital inflows give banks and near-banks a larger supply of funds to intermediate, allowing them to increase credit rapidly[3]. While some argue that the core of the problem lies in the moral hazard behaviors of banks in explaining the lending booms[4], there is a belief that these events arise not just because of the moral hazard behaviors

[2] Kaminsky and Reinhart (1999) show that several of the recent lending booms and asset price inflation had also preceded financial crises in Latin America and Asia. The evidence shows that the link between lending booms, asset price inflation, and financial crises has been quite robust in emerging markets. It is also clear that the vulnerability of a weakened banking sector was an important constraint on the deteriorating balance of payments in Mexico in 1994 and in Thailand in 1997.

[3] It took different forms in different countries, however, the lax regulation of financial institutions in Southeast Asia meant that poor investment of borrowed funds was not uncommon. They are the excessive property development in Thailand, the over-investment in the *chaebol*[3] of Korea, and the problem of 'connected' lending in Indonesia. See World Bank Report (1997), for example.

[4] Several recent papers have introduced implicit government bailout guarantees to explain lending booms. (Dooley (1997) and McKinnon and Pill (1997)) These papers, however, do not explain interaction between asset prices, and credit and output fluctuations.

but also of balance sheet effects. Although the underlying theories are diverse, a common indication of the balance sheet effects is that capital market imperfections make the spending of certain classes of borrowers depend on their balance sheet positions, due to the link that arises between collateralizable net worth and the terms of credit. This theory predicts that differences in cyclical behavior should emerge across countries, depending on their respective access to capital markets. This prediction leads us to compare the macroeconomic behavior of financially developed and underdeveloped countries[5][6].

This paper presents evidence on the balance sheet effects of 38 countries. Trying to capture the balance sheet effects of net worth, we look at stock price development of each country. Our empirical analysis, then, focuses on cyclical output and credit behavior of financially developed and underdeveloped countries. It also examines the differential response of the two groups of countries to a change in stock prices. Our goal is to gain some empirical sense of the importance of the financial propagation mechanism on aggregate behavior with particular attention paid to asset price movement as the endogenous credit constraint.

The rest of the paper is organized as follows. Section II summarizes the theoretical background and empirical prediction. Section III describes the data set and financial development measures. Section IV presents univariate analysis. Section V presents the multivariate empirical work using panel VAR method. Using the variety of different methods, we show that financially underdeveloped countries show a significantly pronounced response following a shock to net worth (stock prices). We also perform a robustness check of our results. Concluding remarks are in section VI.

II. A Brief Review of the Literature: Theory and Evidence

[5] See, for example, Bernanke, Gertler, and Gilchrist (1998) for aggregate economy, and Kiyotaki and Moore (1997) for firm level study. Aghion, Bacchetta, and Banerjee (1999) explicitly model the level of financial development as a source of financial constraint in extending the financial accelerator framework. See also Caballero and Krishnamurthy (1998), Edison, Luangaram, and Miller (1998), Krugman (1999), and Schneider and Tornell (1998) for aggregate economy studies.

In associating the asset price movements and business cycle behavior, the "financial theories" of the business cycle emphasize the role of borrowers' balance sheets. This view starts as early as Minsky (1986), and has been taken to considerable lengths by many followers. These studies begin with the idea that capital market imperfections make the spending of certain classes of borrowers depend on their balance sheet positions, due to the link that arises between collateralizable net worth and the terms of credit. The asymmetric information between lenders and borrowers implies that the external finance premium depends inversely on borrowers' net worth with credit market imperfection. This leads directly to a financial propagation mechanism whereby swings in balance sheets over the cycle amplify swings in spending.

Kiyotaki and Moore (1997), for example, analyze a stylized example in which land serves both as a factor of production and as a source of collateral for loans to producers. In this economy, a temporary shock (to productivity, for example) lowers the value of land and hence of producers' collateral. This leads in turn to tightened borrowing constraints, less production and spending, and finally to still further reductions in land values, which propagates the shock further through time. Aghion, Bacchetta, and Banerjee (1999) also examine the role of financial constraints as an important factor in macroeconomic fluctuations. Their study is distinct from other studies of financial propagation because they focus on the level of financial development as a factor determining the extent of instability[7].

Our analysis is based on the large body of theoretical work that shows that information problems and the level of financial development can have important effects on macroeconomic fluctuations. We also try to show that those effects are asymmetry

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[6] Other way to associate financial liberalization with macroeconomic dynamics, see Bacchetta and Wincoop (1998)

[7] There is another way of thinking about how financial factors might influence the economic activity. That is known as the "credit" or "lending" view, which stresses the ability of monetary policy to regulate the pool of funds available to bank-dependent borrowers, owing to the presence of legal reserve requirements on bank deposits. This ability, to the degree that it exists, provides monetary policy with additional leverage over the spending of bank-dependent borrowers. This theory suggests that that monetary policy should have a disproportionate impact on borrowers with limited access to capital markets, everything else equal. This view, however, is limited to bank-oriented countries, and does not have direct association with asset price

across cycles. The financial mechanism described here are likely to be more potent in downturns. Credit constraints are likely to bind across a wider section of underdeveloped countries in recessions than in booms. This suggests that underdeveloped countries should maintain a tighter link between production and credits in bad times than in good times.

Turning from theoretical to empirical research, we note that there are very few examples of macro models including capital-market imperfections that have been estimated. Empirical investigation focusing on the financial accelerator theory has been undertaken intensively at firm-level behavior. For example, Gertler and Gilchrist (1994) examined the response of small versus large US manufacturing firms to monetary policy. They find that small firms account for a significantly disproportionate share of the manufacturing decline that follows a liquidity squeeze. Hoshi, Kashyap, and Scharfstein (1991) looks at Japanese firms and find that the investment is more sensitive to liquidity for the firms that have weaker links to a main bank and presumably faces greater problems raising capital[8].

As opposed to the intensive empirical studies at firm level, evidence at the aggregate level is scarce. The quantitative research most closely related to the financial theory uses the calibration technique as in Bernanke, Gertler, and Gilchrist (1998). They show that a positive shock to entrepreneurial wealth has essentially no effects in the baseline model, but has both significant impact and propagation effects when credit-market frictions are present. Izquierdo (2000) show an asymmetric behavior of cyclical components of several macroeconomic variables, such as GDP, credit, and real exchange rate using Sichel's approach[9]. He shows that the macroeconomic variables are asymmetric particularly in Latin American countries, which possibly is a consequence of the balance sheet effects. Nonetheless evidence using actual macro data is missing in assessing the quantitative significance of the financial accelerator mechanism.

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movements. Bernanke and Blinder (1992), Romer and Romer (1990), and Kashyap, Stein, and Wilcox (1993) provide further discussions of the credit view.

[8] See also Fazzari, Hubbard, and Petersen (1988), and Gilchrist and Himmelberg (1995).

[9] Sichel (1989) looks at skewness elements of the cyclical components in order to assess the asymmetry.

This paper intends to complement the theoretical works and previous empirical studies by providing a rough feel for the potential quantitative significance for real and financial cycles at aggregate level. Therefore the contribution of this research is to provide the evidence of 1) whether 'financial accelerator' mechanism exists at aggregate level, 2) if it exists, whether the effect of the mechanism is potent in financially underdeveloped economies and not in developed, and 3) whether the effect is more pronounced in downturns of economic cycles rather than upturns.

III. Data description and Financial Development Measures

A. The Data

We study three quarterly variables: industrial production, bank credit to the private sector to output ratio, and stock price spanning from 1961:Q1 to 1999:Q2, where available. We use industrial production indices as an indicator of a country's aggregate activity over time. Credit to production ratio is also of interest. Kiyotaki and Moore (1997) explicitly models 'Credit Cycle' rather than investment cycle. As we are interested investigating macroeconomic behaviors of countries with limited access to capital markets, the behavior of bank credit is important to business fluctuations

The financial factors may propagate any type of shock to aggregate economic activity. Practical considerations, however, dictate using stock indices to proxy for a shock in net wealth. Doing so enables us to employ a data set that is comprehensive for the developed and underdeveloped countries. As a consequence, we can directly assess the quantitative importance of our findings between developed and underdeveloped countries.

The industrial production and domestic credit to private sector data are taken mainly from International Financial Statistics (IFS) except for some countries, which we take from the country's published statistical documentations. The stock market

index is taken from IFS and the World Bank Emerging Market Database. (See Data appendix 1 for country list and data source.)

The major advantages of using the industrial production are that it (i) provides cross-sectional information at the business cycle frequency for many countries of interest and (ii) is comprehensive for industrial sector. These two features permit us to directly infer the quantitative significance of differences in financially developed and developing countries for manufacturing fluctuations. Other aggregate measures such as gross domestic production restricts our attention to financially developed countries and therefore under represent developing countries. Also, the gross domestic production is often only available at an annual frequency[10].

B. Measuring Capital Market Access by Level of Financial Development

To assess whether the financial and business fluctuations depend on the level of financial development, we create an index of each country's accessibility to capital markets. In particular, the development of primary capital markets is of great importance when we examine whether the country is financially constrained or not.

Our measures of financial developments are six measures of financial variables. The three of the six measures of financial depth are from banking sector: 1) domestic credit / GDP ratio, 2) net interest margin, and 3) asset / GDP ratio. There are also three measures for equity markets: 1) turnover ratio, 2) volume traded / GDP ratio, and 3) market capitalization / GDP ratio[1112]. These measures account for financial size,

[10]The industrial production data do not include agricultural or service sector, which may be the major sector of the economy. Although this introduces a bias measuring the aggregate activity of the economy, focusing only on industrial sector also benefits us in several ways: (i) by focusing only on the industrial sector, we do not need to sort the cyclical differences across different sectors, and (ii) as the industrial production steadily accounts for about 30% of the economic activities, it well represents the economic activities. The shares of agricultural or service sectors, on the other hand, fluctuate lot more than the industrial sector.

[11] Data on the four measures are taken from the World Bank data source. They are available from 1960 to present for all of the countries in our sample. They are at annual frequency.

[12] Gertler and Gilchrist (1994) use size of firm asset to measure the capital market access in their US firm level study. Hoshi, Kashyap, and Scharfstein (1991) look at business groups (Keiretsu) in their study on Japanese firms behavior.

efficiency, and activity rather than primary market[13]. We use these measures partly because of the supporting evidence, which shows significant correlation between financial depth and primary market development, but mainly because of their comprehensive data availability[14].

The means of the six measures are shown in Table 1 for each country. We classify each country as financially developed when the mean of the measure is above the sample mean. Table 2 reports the classification for each financial measure. The value takes one if the mean of the country is greater than the sample mean, and takes zero otherwise. We then create an index of banking and equity market depths separately[15]. In order to create the banking and market depth indices, we take average of the three measures in each. Finally the summation of the two indices is used as the financial depth index in order to classify the countries into three different levels of financial development. Therefore, the financial index ranges from 0 to 2. The maximum index is 2 when both banking and equity markets are deep, and the minimum index is zero when both of the markets are underdeveloped. If the index is less than or equal to 1.0, the country's financial depth is classified as 'LOW.' The classification is 'DEEP' if the index is greater than 1.0.

There are two limitations to our dataset. The first is that this created financial depth index does not include several important factors such as legal environment, prudential regulations, or differences between bank-oriented and market-oriented financial systems. In order to give a sense of how each country may be mapped in terms of financial structure, we include the measure created by Demirguc-Kunt and Levine (1999) in the last column in Table 2. They classify the countries into four groups based

[13] For more comprehensive set of financial development measures, see Beck, Demirguc-Kunt, and Levine (1999).

[14] In assessing whether the depth measures are appropriate for the primary market activity, Aylward and Glen (1999) show that primary equity issues should be positively correlated with financial depth. They examine aggregate primary capital market activity in a cross section of emerging markets and developed countries and show that market depth is a significant explanatory factor for equity issuance activity. Thus, we believe that our proposed measures of financial development are reasonable from the standpoint of reflecting capital market access.

[15] Some may argue that the index may be misleading the countries such as Malaysia or the Philippines whose mean values are much higher than the median values due to the rapid financial development during the 1990s. It turned out that these countries belong to the same financial level classification even when we use median value instead.

on comprehensive set of financial variables from banking and equity market. The four groups are the combinations of overall financial development and structures. Their index is consistent with our financial index. We did not use the Demirguc-Kunt and Levine index in our study because their index is created based on limited period (only early 1990s).

The second drawback of the measure is that some countries in our sample have experienced rapid financial developments during the sample period. Therefore, they may belong to different levels of financial developments in the sample period. Although it would be more accurate to split those countries to sub samples depending on the levels of financial developments, we are constrained to classify each country to one level due to the small sample.

We next present some information suggesting that our grouping of financially developed and developing countries is reasonable from the standpoint of reflecting capital market access. Table 3 presents information on the composition of debt finance. The numbers are tabulated by the financial index that we created. The composition of the domestic debt suggests two main features of LOW countries. First, they rely proportionately more on debt rather than equity finance. Second, majority of the debt is issued by the government, and very little by private sector. The composition of the external debt again confirms that LOW countries are constrained in raising fund through equity markets.

Although the periods are limited, these differences in financial structure are intuitive and are consistent with the previous literature[16]. The result suggests significant differences in capital market access across the financial development levels that we created.

[16] Greenwald and Stiglitz (1993) construct a model in which firms have access only to debt financing. Because bankruptcy is costly, firms are reluctant to become highly levered: their initial equity or net worth thus effectively constrains the quantity of funds that can be raised in capital markets.

IV. Univariate Analysis of Production and Credit Cycles

The empirical work proceeds in three main stages. First, we present an informal descriptive analysis, designed to illustrate the basic properties of the cycles. We apply univariate analysis summarizing the extracted cycles by the level of financial development. Second, we quantify the relative responses of financially developed and underdeveloped countries to a change in the stock market using three variables VAR analyses. Finally, for reasons discussed earlier in the introduction, we also look for asymmetries over the cycle. This section gives the results of the first stage.

A. Identification of Cycles

There is no objective or universal definition of business cycles. Thinking about how to define the cyclical component, means confronting the classical statistical problem of representing a given time series, y say, as the sum of a trend component, a cyclical component, a seasonal component, and a noise component. Therefore, a possible decomposition is:

$$y = \text{trend} + \text{cycle} + \text{seasonal} + \text{noise} \qquad (1)$$

Most researchers in the real-business-cycle tradition have, in fact, chosen to remove a smooth, but variables trend from the data. Kydland and Prescott (1990) cite as one of their criteria for choosing a trend that: 'The trend component for real GNP should be approximately the curve that students of business cycles and growth would draw through a time plot of this time series.' According to their criterion, it is common to think about business cycles as having an average length of about 5 years. This is the number of Moore and Zarnowits (1986) cite for the USA, both before and after the Second World War.

We take our stand in accordance with what we perceive to be the popular perception of cyclical fluctuations in financial propagation theory. As we are interested

in investigating the financial propagation mechanism, some extracted cycles can be longer than business cycles frequencies of 32 quarters. In order to avoid confining ourselves to look at specific frequencies cycles, we use the time filter by estimating its trend by regressing the series on time polynomials.

$$y = \alpha + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \beta_4 \sqrt{t} + \varepsilon \qquad (2)^{17}$$

The deviation of the series from its fitted trend is, thus, taken as the cyclical component. We also look at the Band Pass filter with longer band than the business cycle frequency as a robustness check.

Figure 1 plots the extracted cyclical components using three detrending methods: they are first difference, Baxter and King Bandpass filter with a band between 6 and 40 quarters[18], and time trend fitted filter. The first difference method intends to obtain stable series and extracts only high frequency cycles, which are shown in (a). The extracted cycles seem to be noise components of the series. We cannot see boom and bust cycles with this method. As we are interested in lower frequency cycles, the first difference is not appropriate in this study[19]. Next figure (b) plots the Band Pass filtered cycles. This Bandpass filter is designed to include frequencies between 6 and 40 quarters, which are about 20% longer than the conventional business cycle frequencies. The last figure (c) plots the cyclical components using the time trend method. The amplitudes of the cycles are larger and the duration is slightly longer than the Bandpass cycles.

Since we are interested in booms and busts episodes as a result of the financial propagation mechanism, we believe that it is more appropriate to apply the time

[17] We experiment with several variations of time filters. The extracted cycles using those filters do not show significance differences.

[18] The Baxter and King's (1999) bandpass filter is a modified HP filter, which extracts the cycles with frequency exactly between i and k frequencies.

[19] Baxter (1994) investigates the link between real exchange rates and real interest differentials over the recent floating-rate period. In contrast to earlier econometric studies, the author finds evidence of a relationship, with the strongest link at trend and business cycle frequencies. Because these prior studies focused on high-frequency components of the data, they found no statistical link between real exchange rates and real interest differentials. For more discussion of different detrending technique, see Stock and Watson (1998).

polynomial filter. Hence our first and preferred filter is the time polynominal filter, but we also examine the Bandpass filtered cycles as a robustness check.

We then identify expansions (contractions) by defining local peaks (maximum) and troughs (minimum) of the cyclical components.[20] As in the conventional business cycles literature, a contraction is defined as the time period between a peak and the following trough. Any period not belonging to contraction is called an expansion. The amplitude of the expansion (contraction) is measures as the change between the peak and the following trough as a percentage deviation from the trend. Finally, the duration of a contraction (expansion) is defined as the number of quarters between a peak (trough) and the following trough (peak) of the detrended series.

B. General characteristics

Following Kaminsky and Schmukler (2000), we examine the characteristics of the cycles of all the countries and according to the degree of financial development. Using the time polynomial filter, we extract 249 output cycles and 131 credit cycles in our sample. Table 4 reports the average characteristics of the production and credit cycles. We present the result of both time and Bandpass filters.

The mean duration of the production cycles is 17 quarters. The production booms and contractions across all regions oscillate around 19%. The result suggests that overall contractions are short-lived relative to expansions. The mean duration of expansions is around 9 quarters and statistically different from the duration of contractions at all conventional significance levels.

As for the credit cycles, they exhibit a longer duration than that of production cycles, with a mean duration of 31 quarters. The data also suggests that the amplitudes of the booms and contractions of the credit cycles are smaller than output cycles with mean amplitude of 33% deviation from its trend. Therefore, the typical credit cycles are more protracted and more volatile. The results from the Bandpass filter also show that the credit cycles are more pronounced, but the durations seem similar in length.

This may be due to the fact that we are constraining the maximum duration of the cycle being 40 quarters by definition.

C. Cycles by the Level of Financial Development

We then tabulate the extracted cycles by the level of financial development we described in Section III. Table 5 presents the duration and the amplitude of the output and credit cycles in a same manner as in Table 4. We compute the volatility of the cycles by dividing the amplitudes by its duration, which is shown in the last two columns.

The results of time filter suggest that the duration of both the production and credit cycles become longer in financially deep economies as compared with the underdeveloped ones. The amplitude of the cycles on the other hand become smaller as financial system develops. As the theory predicts, we are interested in investigating the volatility in order to examine whether the volatility is larger in financially underdeveloped economies, or in LOW group. The average volatility of the production (credit) cycles increases from about 1.0% (1.2%) to 2.5% (2.8%) when moving from LOW to DEEP group. The volatility is measured as percentage deviation from the trend per quarter. This evidence indicates that the cycles are more volatile in financially underdeveloped economies. In other words, the cycles build up and collapse significantly faster in underdeveloped economies. Furthermore, when we compare boom periods with crash periods, we can find that the speed of collapse is faster than that of build up. This is consistent with what the financial theory predicts in that the balance sheet effects are stronger in downturns rather than in upturns[21].

As a robustness check we also examine the bandpass filtered cycles. The results of the Bandpass filter also suggest that the amplitude of the cycles become smaller as

[20] We impose a constraint on the length of upturns and downturns greater than three quarters. This way, we avoid including most volatile cycles this way.

[21] Izquierdo (2000) also show asymmetry for Latin American and Asian countries. He shows that GDP and credit in Latin America, and credit in Asia show asymmetric behavior. He first constructs the cyclical components of the variables using Hodrick and Prescott filter, and then regressing the skewness elements of

financial system develops[22]. The production (credit) cycles' duration, on the other hand, does not show significant differences across different financial levels. This may be due to the fact that the bandpass filtered cycles suffer from being constrained to the lowest frequency of 40 quarters. What we concern, however, is the volatility of the cycles. When we look at the volatility, the average volatility of the production (credit) cycles increases from about 1.0% (1.0%) to 1.4% (2.0%) when moving from LOW to DEEP group. In other words, the cycles again build up and collapse significantly faster in underdeveloped economies even when we use the Bandpass filter.

The results above are consistent with the financial accelerator hypothesis in that the economies are more volatile with underdeveloped financial systems. Although the output and credit cycles can be driven by non-financial factors, the result is still interesting enough to show the significant different cyclical behaviors across different levels of financial development.

Figure 2 plots the typical production and credit cycles, and also plots the cycles by the level of financial development. The figure shows an additional stylized fact of how the cycles develop in upturns and in downturns. The typical cycles of all the countries just confirm what we discuss above. The extra finding from the figure is the development of downturn cycles in financially underdeveloped countries. The figure shows that the production cycles collapse sharply at the beginning. The collapse of the cycles is particularly significant during the first three quarters after the peak. It then stabilizes. The credit cycles, on the other hand, collapse steadily during the downturns.

V. Empirical Result Using VAR

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the components on constant to test the significance. He, however, does not test whether that is downturns or upturns which give the skewness.

[22] The difference in a magnitude of amplitudes using different detrending methods are consistent with what Stock and Watson (1998) find in their paper for industrial production of USA.

A. The Business Cycle Response of Financially Developed and Underdeveloped Countries to a Change in Stock Prices

We now supplement the univariate analysis with multivariate analysis. We estimate reactions of both the production and credit cycles to a shock in stock prices using panel VAR method[23].

The estimation strategy has been applied to the sample of 31 countries[24], of which 20 have been classified as financially underdeveloped counties, 11 as developed countries[25]. We estimate a tri-variate VAR for each group that includes output (Y), credit (C), and stock market index (S). The idea is to ascertain, in the simplest fashion possible, the statistical significance of the change in stock prices[26] for the dynamics of production and credit cycles across different levels of financial development.

$$X_{tn} = B(0)X_{tn} + B(L)X_{tn} + \varphi_{tn} \qquad (3)$$

Where X is a vector of (Δlog(Y), Δlog(C), Δlog(S)), φ is a vector of stochastic impulses driving the model, B(0) is a coefficient matrix of contemporaneous relations, and B(L) is a matrix of lag polynominals defined by $B(L) \equiv \Sigma$ Bj Lj. L is the lag operator (i.e. LjXt $\equiv$ X t-j). n is 20 for the LOW group and 11 for the DEEP group. We include a constant term, seasonal dummy variables, and two lags of the relevant quantitative variables in each regression[27]. All the series are normalized to zero mean. We give one unit shock when we compute impulse response functions in order to be able to

[23] Gertler and Gilchrist (1994) take average of all the series of firms and apply VAR method. It is not, however, relevant to our study because our sample consists of 31 countries, which suffer from different domestic macroeconomic shocks at different times. They look at a shock to Federal Fund Rate in order to examine the balance sheet effects in their study.

[24] We reduce the sample size to 31 countries in this exercise due to missing stock price observations for 8 countries. They are Bangladesh, Greece, Hong Kong, Jordan, Singapore, Turkey, and Uruguay.

[25] The number of countries of each group is far from equal. Instead of dividing into same number of countries in each group, we try to have even number of observations in each group.

[26] The stock prices are measured in US$. We estimate the regression with stock prices in domestic currency as well, and find that the results are consistent with the ones with in US$.

[27] We also examine the model with 4 lags. The result is consistent with that of 2 lags. In order to give more degree of freedom, we choose to use 2 lags due to smaller sample size in some countries.

estimate the parameters consistently, and also to make the result comparable across the different groups. All the variables are in log first differences[28]. Choleski decomposition was used to orthogonalize the underlying errors using the ordering stock market indices, credit, and production. The ordering determines the level of exogeniety of the variable. The ordering was chosen on the basis of the speed with which the variables respond to current events, which production variable assumed to be the least responsive, followed by credit, then stock prices.

Figure 3 and Table 7 summarize the results of the VAR estimation. This multivariate result is also consistent with what we find with the univariate analysis in that the volatility is larger in the LOW group. The figure plots the impulse response functions (solid line) to a unit shock in stock prices and ± one standard deviation (dotted lines) by the level of financial development. The estimated coefficients on the stock markets are shown in Table 7, and are positive numbers, indicating the propagation mechanism of the balance sheet effects. Table 7 also reports the test statistics of the differential effects of the responses between the different levels. The test is based on general linear restrictions on the slope coefficients in the VAR model[29]. The null hypothesis is that the slope coefficients for the stock prices in different levels of financial development are the same.

The duration of the responses is similar across different level of development. The responses start to converge to zero by 8th quarter after the shock. The magnitudes of the responses of LOW group rise by about 0.8% while it is about 0.2% in DEEP group. The volatility or the excess sensitivity to a shock in stock price or net worth is found in LOW group as the theory suggests. This result almost mimics the Bernenke, Gertler, and Gilchrist's (1998) model economy with investment delay. In their economy with financial accelerator, the output response rises by about 0.9%, while an economy without financial accelerator show only a half of the responses. Those responses fade by about 8 quarters as our results confirm. The developments of the impulse response

[28] We also examined the model with series in log levels. The result of VAR estimation is consistent with that of log differences.
[29] See Kireyev (2000) for another example.

functions are also interesting to examine. As we have found in the Figure 2, the response of production contracts sharply after the shock, while the credit response fades away gradually. The VAR results are consistent with what we find with the univariate analysis.

In order to assess the statistical significance of the differential effects between LOW and DEEP groups further, we report the test result of whether the stock price coefficients of the two groups are the same. The rejection is significant at 15% (9%) when we test the differential effects between LOW and DEEP group for production (credit). Both production and credit responses to a unit rise in stock prices are significantly larger in LOW group at conventional significance level[30]. The result is consistent with the prediction of the financial accelerator hypothesis implying that the balance sheet effects are more prevalent in financially underdeveloped economies.

B. The stock price and asymmetries.

We turn to investigate the asymmetric nature of the responses of production and credit to a change in stock prices. As section II describes, the financial propagation mechanism is likely to be asymmetric over the cycle – more potent in downturns than in booms if stock prices serve as the country's wealth. This nonlinear behavior arises because the credit constraint binds more tightly in bad times, when balance sheets are weak. We expect, for example, that production smoothing by a financially constrained country is more difficult around these episodes, than relatively good times, when balance sheets are strong.

We pursue this idea by splitting the period into good and bad times, allowing for an asymmetric response to a change in stock prices. Due to both direct and indirect effects on balance sheets, we should expect that a shock in stock prices has a larger impact on financially underdeveloped economies. In bad times, for example, financially

[30] The rather weak significance with production may be due to the oscillation of the production response.

underdeveloped economies should be more prone to become credit constrained and therefore find it hard to smooth production as the stock price decline[31].

In order to test for the asymmetries, we allow the coefficients on the stock prices and the constant term to vary depending on whether the stock price index cycles are in upturns or downturns. Figure 4 and 5 plot the impulse response functions of production and credit in upturns versus downturns for each level of financial development. We also report the test statistics of the differential effects across the two periods in Table 8 and 9. The test is based on general linear restrictions on the slope coefficients in the VAR model as in the previous section. The null hypothesis is that for each group, the slope coefficients of the stock prices across upturns and downturns are the same. The test statistics are for each group and for both production and credit impulse responses.

Figure 4 and Table 8 summarize the result of the production responses. In the LOW group, the response of downturns is larger than that of upturns as the theory predicts. The amplitude of the response is about twice as large in downturns, while this is not the case in the DEEP group. The amplitudes of upturns and downturns in DEEP group do not show significant difference. The statistical test in Table 8 confirms this observation; the test rejects the hypothesis of equal coefficients at 2% significance level. The production response to a change in stock prices is more sensitive in downturns than in upturns. In other words, the balance sheet effect is smaller in good times, but it becomes apparent in downturns in the LOW countries. That is when their economic activities become subject to financial constraint.

Figure 5 and Table 9 summarize the result of the credit response. Again, the evidence of the asymmetries is found with credit responses. The response of downturns is larger than that of upturns in the LOW group, the magnitude reaches almost at 0.8% in downturns. The difference between these two is statistically significant at 1%. In the DEEP group, on the other hand, the responses are almost

[31] Although it is outside of the scope of this paper, Aghion, Bacchetta, and Banerjee (1999) gives an explanation of why The financial factor matters during boom period instead of bad time in some economies. That is due to imperfect regulations of banks.

none, and the difference between upturns and downturns can be hardly observed. The evidence of asymmetric behavior of LOW group helps reconcile why the financial factors may be at work. Technological factors do not naturally explain why financially underdeveloped countries' (and only those countries) production and credit dynamics vary across the cycles[3233].

C. Robustness of the Results

While the results in the previous sections are consistent with the notion that balance sheet effects are important for macroeconomic fluctuations, they are also subject to other interpretations. Two standard criticisms are that: 1) the underdeveloped countries may be concentrated more heavily in cyclical industries and 2} the stock price may be endogenous because it contains the future information of the economy.

The first criticism is particularly true for the behavior of industrial production. One possibility is that the underdeveloped countries may be concentrated more heavily in cyclical industries. In other words there may be "diversification benefit" in developed countries, that is, overall business cycle volatility decreases with sectoral diversification. Another is that large countries smooth the impact of variation by contracting out to developing countries in booms but servicing all production internally in recessions. Since we cannot provide direct controls for all the potential nonfinancial alternatives, we take several steps to address the observational equivalence problem.

First, we find significantly different responses across different levels of financial development with credit. Neither diversification effects nor contracting out can easily explain differences in credit behavior that may arise after controlling for the influence of production. Second, we find asymmetries over the cycle both with production and

[32]I estimate VAR grouping countries into 3 groups. I create MEDIUM group with the financial index being 0.7 and 1.0. The impulse response functions of production and credit of the MIDIUM group are closer to those of DEEP, while asymmetric response between upturns and downturns is found with production.
[33] I also estimate VARs without hyperinflation periods. I exclude the periods above annual inflation rate of 50%. The estimations of this sample did not change the results.

credit. Differences in technological flexibility do not naturally predict this variety of outcomes.

As for the second criticism, the ambiguity arises because the stock price may be endogenous because it contains the future information of the economy. If this is the case, it would not be surprising to see these economies respond to a change in stock prices[34].

In order to address this issue, we show that the balance sheet effects are still significant explanatory factor of the macroeconomics fluctuations even after controlling for the information content of the financial variable. Following Kashyap, Lamont, and Stein (1994), we show two basic ways that one can address this ambiguity. The first approach involves using a priori theoretical arguments to sharpen our predictions relative to the endogenous stock price or net worth hypothesis. The second approach is to estimate the coefficient on stock price using an instrumental variable procedure that should mitigate any endogeniety bias. We present the results of both approaches in Table 10. We estimate the following equation;

For the first approach, the evidence of the asymmetric behavior between LOW and DEEP or between upturns and downturns in the previous section explains all. If the responses are driven only by the information content of the stock prices, we should not expect the asymmetric responses across LOW and DEEP or across downturn and upturns. This is because if the business cycles fluctuations can be fully explained by the lagged stock prices at all times, we should expect the coefficients of the stock prices remain the same whether or not they are in upturns or downturns. We estimate several

[34] The theory comes from the view of "leading indicator," which says that the correlation between asset prices and economic activity is solely due to the fact that asset prices incorporate information about future output growth. Current prices represent the discounted value of the expected dividend growth and that, to the extent that such assets are traded in deep and well-informed auction markets, expectations about future dividend growth tend to be rational. From this view point, no behavioral causal relationship running from asset prices to economic activity exists; the only causal connection is between current and future output growth, with stock markets thus merely being a "side-show." Fama (1990) and Asprem (1989) for example examined leading indicator property of asset prices to output growth particularly in industrial countries. As for emerging markets, Mauro (2000) finds that stock returns also led output growth in several countries.

regressions to confirm this asymmetry with OLS. The underlying OLS equation is as follows.

$$\Delta \log(Y_{tn}) = \alpha + \Delta \log(C_{tn}) + \Delta \log(C_{(t-1)n}) + \Delta \log(S_{tn}) + (D_{LOW} * \Delta \log(S_{tn})) + \varphi_{tn} \quad (4)$$

Where D_{LOW} is a dummy variable, which takes value 1 if the county belongs to LOW group, and takes value zero otherwise. Table 10 reports OLS regression results in panel A. In each of the 8 regressions the dependent variable is the change in the log of industrial production over the year. In row 2 of Table 10, we add another variable to the OLS specification of row 1. This variable is given by Δlog(Stock)*LOW (a dummy variable, which takes 1 if the country is in the LOW group, and 0 otherwise). We find in this regression that the coefficient is significant only on the Δlog(Stock)*LOW, but not on the Δlog(Stock). The coefficient on the stock price of all countries becomes insignificant unlike the one in the 1st specification. If the stock price is simply the information content of the economy, one might expect that this effect would be similar for all countries and hence that Δlog(Stock)*LOW would have a coefficient of roughly zero.

Rows 3 to 8 make a similar point. Rather than using the Δlog(Stock)*LOW interaction term, the equations (with just the Δlog(Stock) variable) are run separately for the DEEP and LOW groups. The equations are estimated separately also for the upturns and downturns of the two groups. This allows the two groups or cycles to have different intercepts and different sensitivities. For the LOW group, the stock price is again positive at 0.14 and significant at 2%. For downturns versus upturns, the results are rather weak, yet we can still find that the coefficients are larger in downturns and they are more significantly so than in upturns. This can be said for both DEEP and LOW groups.

In Panel B of Table 10 we rerun the specifications in row 1-8, using IV, rather than OLS. The underlying model for the IV estimation is as follows.

$$\Delta \log(Y_{tn}) = \alpha + \Delta \log(C_{tn}) + \Delta \log(C_{(t-1)n}) + \Delta \log(S_{tn}) + (D_{LOW} * \Delta \log(S_{tn})) + u_{tn}$$
$$\Delta \log(S_{tn}) = \Delta \log(S_{(t-1)n}) + \Delta \log(S_{(t-2)n}) + v_{tn} \quad (5)$$

Since we suspect that the current innovation of the economy may be fully explained by the lagged stock prices, we instrument the current stock price with its lagged values. Table 10 reports the instrumental variable regression results in panel B. In each case, we use a country's lagged value of stock price as an instrument. This instrumenting procedure should mitigate any problems that arise from stock prices proxying for recent innovation in the economy. The results in Panel B of Table 10 are similar to those obtained with OLS. For the LOW group, the stock price coefficient remains at 0.14 as in OLS. For downturns, the coefficients become more significant. In particular, the coefficient of the stock price in downturns of the LOW group increased from 0.13 to 0.16 and becomes statistically significant at 9% level. Again, this supports the prediction of the financial accelerator hypothesis[35]. Although there may be situations in which there remains some residual endogeniety bias, the results are intuitive and confirm our priors. Our results demonstrate that financial factors do indeed influence output and credit movements.

VI Conclusions

Many have claimed that the asset price boom play a significant role in propagating financial factors and led to protracted recession, namely as the "financial accelerator." Furthermore, the financial accelerator is said to be more significant in financially developing or underdeveloped economies. In this paper, we attempt to investigate these claims associating liquidity constraint with real and financial business cycles.

[35] For related studies investigating information content of financial variable in this context, see Gilchrist and Himmelberg (1995). They model a forward=looking role of cash flow in a structural model for investment. Using firm-level data, they confirmed that the predictive power of cash flow for future MPK in a model with perfect capital markets could account for a significant portion of the overall explanatory power of cash flow for investment. But they also find evidence against the model.

The results we obtain in this paper are generally intuitive. We took several measures to show that financial factors may be at work, and find that booms and busts are more volatile in financially underdeveloped economies, or the emerging markets that are concentrated in Latin American and Asian regions. We also find that these countries also subject to the balance sheet effects particularly in bad times by examining asymmetric behavior of responses to a shock in stock prices.

Our analysis complements the theoretical works and previous empirical studies by providing a rough feel for the potential quantitative significance for real and financial cycles. As financial theory argues, this evidence supports the "excessive" nature of credit and production booms in economies with imperfect financial development. There are other factors that affect the production and credit behaviors. Whether it is mainly financial or technological factors (or both) that are at work, further study of the behavior of the financially underdeveloped countries or emerging markets clearly seems warranted. In light of the increasing financial globalization we are experiencing today, we need to consider the financial factors in seeking appropriate policy options at the time of external shocks to stock prices, or net worth, of the country.

While we create the financial development index accounting for the depth of banking and capital markets, it is also important to examine the legal and prudential regulation developments, and the financial structure. By examining the ability of legal enforcements of the country, we can assess another important aspect of the financial development. It would also enable us to explain possibilities of moral hazard problems[36].

Considering other measures of net worth than the stock prices would also be important. By looking at the behavior of real exchange rates and its impact on foreign currency debt (external wealth of countries, for example), we may be better able to analyze the importance of change in net worth, particularly for emerging markets. In other words, some argue that the financial fragility exacerbates the response of

[36] See Fama (1990), and La porta, Florencio, Shleifer, and Vishny (1997).

exchange rate to a shock, and it makes contractions in home output and dollar value output. These issues surely remain to be a future work.

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Appendix 1A: List of country

1. Argentina
2. Australia
3. Bangladesh
4. Brazil
5. Canada
6. Chile
7. Colombia
8. Denmark
9. Finland
10. France
11. Germany
12. Greece
13. Hong Kong
14. India
15. Indonesia
16. Ireland
17. Israel
18. Italy
19. Japan
20. Jordan
21. Republic of Korea
22. Malaysia
23. Mexico
24. New Zealand
25. Norway
26. Pakistan
27. Peru
28. Philippines
29. Portugal
30. Singapore
31. Spain
32. Sri Lanka
33. Sweden
34. Switzerland
35. Turkey
36. United Kingdom
37. United States
38. Venezuela

Appendix 1B: Data sources

1. Industrial production

Industrial production index is taken from International Financial Statistics (line 66) except for three countries listed below.

Argentina: "Indicadores De Coyuntura," Fundacion de Investigaciones Economicas Latinoamericanas, various issues.
Brazil: "Boletim Do Banco Central Do Brazil," Central Bank of Brazil, various issues.
Venezuela: "Boletin Mensual," Banco Central de Venezuela, various issues.

2. Credit

Credit is taken from International Financial Statistics (line 22 and 32).

3. Stock market indices

Stock market indices are taken from International Financial Statistics (line 62) and Emerging Market Database.

Table 1: Financial development measures

	Country mean					
	Banking Measures			Equity Market Measures		
Country	Credit / GDP	Net Interest Margin	Bank Asset / GDP	Value traded / GDP	Turnover ratio	Market capitalization / GDP
	(%)		(%)	(%)		(%)
Argentina	19	7	18	4	29	12
Australia	50	2	49	36	50	88
Bangladesh	12	1	24	0	56	3
Brazil	39	11	26	11	47	18
Canada	58	2	44	30	63	62
Chile	36	4	29	7	7	80
Colombia	23	6	14	1	9	11
Denmark	45	5	49	13	46	36
Finland	55	2	54	14	48	40
France	79	3	64	18	82	37
Germany	106	2	91	32	154	29
Greece	21	3	33	8	19	20
Hong Kong	154	3	149	98	62	196
India	17	3	23	8	49	24
Indonesia	24	4	24	7	32	16
Ireland	40	1	37	16	62	14
Israel	48	3	65	17	25	34
Italy	61	3	73	10	65	20
Japan	138	2	100	40	39	86
Jordan	45	2	63	12	15	66
Korea	39	2	44	43	94	37
Malaysia	50	3	45	88	31	180
Mexico	22	5	13	10	49	27
New Zealand	38	3	34	20	38	63
Norway	43	3	52	15	68	27
Pakistan	25	3	30	6	31	14
Peru	15	8	14	3	29	13
Portugal	66	3	75	9	54	22
Singapore	69	2	74	63	43	137
Spain	66	4	76	30	130	35
Sweden	79	3	49	34	67	71
Switzerland	124	2	134	111	95	126
The Philippines	25	4	28	13	29	49
Turkey	18	10	19	15	73	14
United Kingdom	54	2	57	49	53	119
United States	85	4	20	53	98	75
Uruguay	31	6	25	0	2	1
Venezuela	31	9	71	3	15	11
Average	51	4	50	25	51	50

Source: Annual data from the World Bank Database and Beck, Demirguc-Kunt and Levine (1999).

Table 2: Financial development measures

	Country mean > Sample mean 1/								
	Banking Measures			Equity Market Measures					
Country	Credit / GDP	Net Interest margin	Bank Asset / GDP	Value traded / GDP	Turnover ratio	Market capitalization / GDP	Country Index 2/	Financial Depth	Demirguc-Kunt and Levine Index 3/
Argentina	0	0	0	0	0	0	0.0	LOW	UNDER_BANK
Brazil	0	0	0	0	0	0	0.0	LOW	UNDER_MARKET
Colombia	0	0	0	0	0	0	0.0	LOW	UNDER_BANK
Denmark	0	0	0	0	0	0	0.0	LOW	UNDER_MARKET
Indonesia	0	0	0	0	0	0	0.0	LOW	UNDER_BANK
Mexico	0	0	0	0	0	0	0.0	LOW	UNDER_MARKET
Peru	0	0	0	0	0	0	0.0	LOW	UNDER_MARKET
The Philippines	0	0	0	0	0	0	0.0	LOW	UNDER_MARKET
Uruguay	0	0	0	0	0	0	0.0	LOW	N/A
Chile	0	0	0	0	0	1	0.3	LOW	UNDER_MARKET
Greece	0	1	0	0	0	0	0.3	LOW	UNDER_BANK
India	0	1	0	0	0	0	0.3	LOW	UNDER_BANK
Pakistan	0	1	0	0	0	0	0.3	LOW	UNDER_BANK
Turkey	0	0	0	0	1	0	0.3	LOW	UNDER_MKT
Venezuela	0	0	1	0	0	0	0.3	LOW	UNDER_BANK
Bangladesh	0	1	0	0	1	0	0.7	LOW	UNDER_BANK
Ireland	0	1	0	0	1	0	0.7	LOW	UNDER_MARKET
Israel	0	1	1	0	0	0	0.7	LOW	DEVELOP_BANK
New Zealand	0	1	0	0	0	1	0.7	LOW	DEVELOP_BANK
Australia	0	1	0	1	0	1	1.0	LOW	DEVELOP_MKT
Finland	1	1	1	0	0	0	1.0	LOW	DEVELOP_BANK
Jordan	0	1	1	0	0	1	1.0	LOW	DEVELOP_BANK
Korea	0	1	0	1	1	0	1.0	LOW	DEVELOP_MKT
Malaysia	0	1	0	1	0	1	1.0	LOW	DEVELOP_MKT
Norway	0	1	1	0	1	0	1.0	LOW	DEVELOP_BANK
France	1	1	1	0	1	0	1.3	DEEP	DEVELOP_BANK
Italy	1	1	1	0	1	0	1.3	DEEP	DEVELOP_BANK
Portugal	1	1	1	0	1	0	1.3	DEEP	DEVELOP_BANK
United States	1	0	0	1	1	1	1.3	DEEP	DEVELOP_MKT
Canada	1	1	0	1	1	1	1.7	DEEP	DEVELOP_MKT
Germany	1	1	1	1	1	0	1.7	DEEP	DEVELOP_BANK
Japan	1	1	1	1	0	1	1.7	DEEP	DEVELOP_BANK
Singapore	1	1	1	1	0	1	1.7	DEEP	DEVELOP_MKT
Spain	1	1	1	1	1	0	1.7	DEEP	DEVELOP_BANK
Sweden	1	1	0	1	1	1	1.7	DEEP	DEVELOP_MKT
Hong Kong	1	1	1	1	1	1	2	DEEP	DEVELOP_MKT
Switzerland	1	1	1	1	1	1	2	DEEP	N/A
United Kingdom	1	1	1	1	1	1	2	DEEP	DEVELOP_MKT

Note: 1/ each measure takes one if the country mean is greater than the sample average of mean.
2/ The index is the sum of the average of banking measures and the average of the equity market measures. The maximum is 2 and minimum is 0.
3/ The index is taken from Demirguc-Kunt and Levine (1999). They classify the countries into four groups depending on whether the overall financial systems are developed or underdeveloped, and whether the systems are bank oriented or market oriented. The index is created based on the average of the relevant variables in 1990s.

Table 3: Composition of Debt Finance by Financial Index

	Domestic 1/		
Financial Index	Equity issues / GDP	LT private sector debt / GDP	LT govt debt / GDP
LOW	0.8	1.2	2.4
DEEP	0.9	8.3	7.1
	External 2/		
	Portfolio equity/GDP	FDI / GDP	Debt / GDP
LOW	1.2	1.1	15.1
DEEP	3.1	0.7	21.0

1/ Domestic debt data are taken from Alyward and Glen (1999). The number is an average over the period of 1980 – 1995.
2/ External debt data are taken from Lane and Milesi-Ferreti (1999). The number is an average over the period of 1970 – 1997.

Table 4: General Characteristics of Cycles

Filtering Method	Duration (in quarters)		Amplitude (% deviation from trend mean)		Volatility (Amplitude / Duration)	
	Boom	Crash	Boom	Crash	Boom	Crash
Industrial Output						
Time Polynominals	9.5	7.9	19.0	18.8	2.0	2.4
Band Pass Filter	5.8	5.1	6.7	6.6	1.2	1.3
Credit						
Time Polynominals	15.6	14.9	33.3	34.0	2.1	2.3
Band Pass Filter	5.8	5.8	9.3	9.1	1.6	1.6

Table 5:
Characteristics of Cycles by Level of Financial Development

		Duration (in quarters)				Amplitude (% deviation from trend mean)				Volatility (Amplitude / Duration)			
Filtering Method	Financial Development Measures	Boom	P Values on equality test	Crash	P Values on equality test	Boom	P Values on equality test	Crash	P Values on equality test	Boom	P Values on equality test	Crash	P Values on equality test
Industrial Output													
Time Polynominals	Deep	14	0.00 ***	10	0.01 ***	14	0.00 ***	13	0.00 ***	0.99	0.02 **	1.36	0.00 ***
	Low	8		7		20		20		2.40		2.65	
Band Pass Filter	Deep	6	0.05 **	6	0.01 **	6	0.03 **	6	0.06 *	0.95	0.00 ***	1.05	0.00 ***
	Low	6		5		7		7		1.30		1.45	
Credit													
Time Polynominals	Deep	20	0.00 ***	18	0.17	24	0.00 ***	23	0.00 ***	1.17	0.03 **	1.31	0.00 ***
	Low	14		15		39		42		2.74		2.78	
Band Pass Filter	Deep	6	0.99	6	0.16	6	0.00 ***	6	0.00 ***	1.02	0.00 ***	0.95	0.00 ***
	Low	6		6		11		11		1.96		2.00	

Note: We performed T-tests of whether mean of the sub samples are equal for duration, amplitude, and speed. *, **, and *** show significance levels at 10%, 5%, and 1% respectively.

Table 10: OLS and Instrumental Variable Estimations (Robustness check)

Dependent Variable: Δlog(Production)

A: OLS	Constant	Log(Credit)	Log(Credit)-1	Log(Stock)	Stock*LOW	NOB	R Sq.
All Countries	0.03 ***	-0.12 *	-0.14 **	0.12 **		3276	0.02
	0.00 0.00	*0.06* 0.05	*0.06* 0.02	*0.05* 0.01			
All Countries	0.03 ***	-0.12 *	-0.14 **	0.01 .	0.13 *	3276	0.02
	0.00 0.00	*0.06* 0.05	*0.06* 0.02	*0.05* 0.75	*0.07* 0.08		
Deep	0.02 ***	-0.02 .	0.14 **	0.02 .		1351	0.01
	0.00 0.00	*0.09* 0.81	*0.06* 0.01	*0.04* 0.71			
Low	0.03 ***	-0.15 **	-0.20 ***	0.14 **		1925	0.03
	0.01 0.00	*0.07* 0.04	*0.07* 0.01	*0.06* 0.02			
DEEP in upturns	0.04 ***	-0.04 .	0.06 .	-0.15 .		435	0.02
	0.01 0.00	*0.12* 0.72	*0.05* 0.22	*0.13* 0.23			
Deep in downturns	0.02 ***	-0.09 .	0.11 .	0.08 .		658	0.01
	0.01 0.01	*0.16* 0.55	*0.07* 0.12	*0.06* 0.19			
LOW in upturns	0.03 .	-0.05 .	-0.13 .	0.02 .		425	0.00
	0.02 0.12	*0.16* 0.74	*0.23* 0.57	*0.15* 0.89			
LOW in downturns	0.04 ***	-0.14 .	-0.14 .	0.13 .		975	0.02
	0.01 0.00	*0.16* 0.40	*0.15* 0.36	*0.10* 0.19			

B: IV	Constant	Log(Credit)	Log(Credit)-1	Log(Stock)	Stock*LOW	NOB	R Sq.
All Countries	0.03 ***	-0.13 **	-0.15 **	0.12 ***		3238	0.02
	0.00 0.00	*0.06* 0.05	*0.06* 0.02	*0.05* 0.01			
All Countries	0.03 ***	-0.13 **	-0.15 **	0.02 .	0.13 *	3238	0.02
	0.00 0.00	*0.06* 0.05	*0.06* 0.02	*0.05* 0.72	*0.07* 0.08		
Deep	0.02 ***	-0.02 .	0.14 **	0.02 .		1339	0.01
	0.00 0.00	*0.09* 0.80	*0.06* 0.01	*0.05* 0.63			
Low	0.03 ***	-0.15 **	-0.20 ***	0.14 **		1899	0.03
	0.01 0.00	*0.07* 0.03	*0.07* 0.01	*0.06* 0.01			
DEEP in upturns	0.04 ***	-0.05 .	0.07 .	-0.14 .		430	0.02
	0.01 0.00	*0.12* 0.71	*0.05* 0.17	*0.13* 0.27			
DEEP in downturns	0.02 ***	-0.10 .	0.11 .	0.08 .		652	0.01
	0.01 0.01	*0.16* 0.55	*0.07* 0.12	*0.06* 0.17			
LOW in upturns	0.03 .	-0.08 .	-0.17 .	0.06 .		419	0.01
	0.02 0.12	*0.17* 0.62	*0.24* 0.48	*0.15* 0.69			
LOW in downturns	0.04 ***	-0.18 .	-0.14 .	0.16 *		963	0.02
	0.01 0.00	*0.16* 0.28	*0.15* 0.35	*0.09* 0.09			

Note: All regressions use robust errors. The standard errors are in italics, and the P values are underlined. *, **, and *** show significance levels at 10%, 5%, and 1% respectively.

Figure 1: Cyclical Components of Credit: Example from Mexico

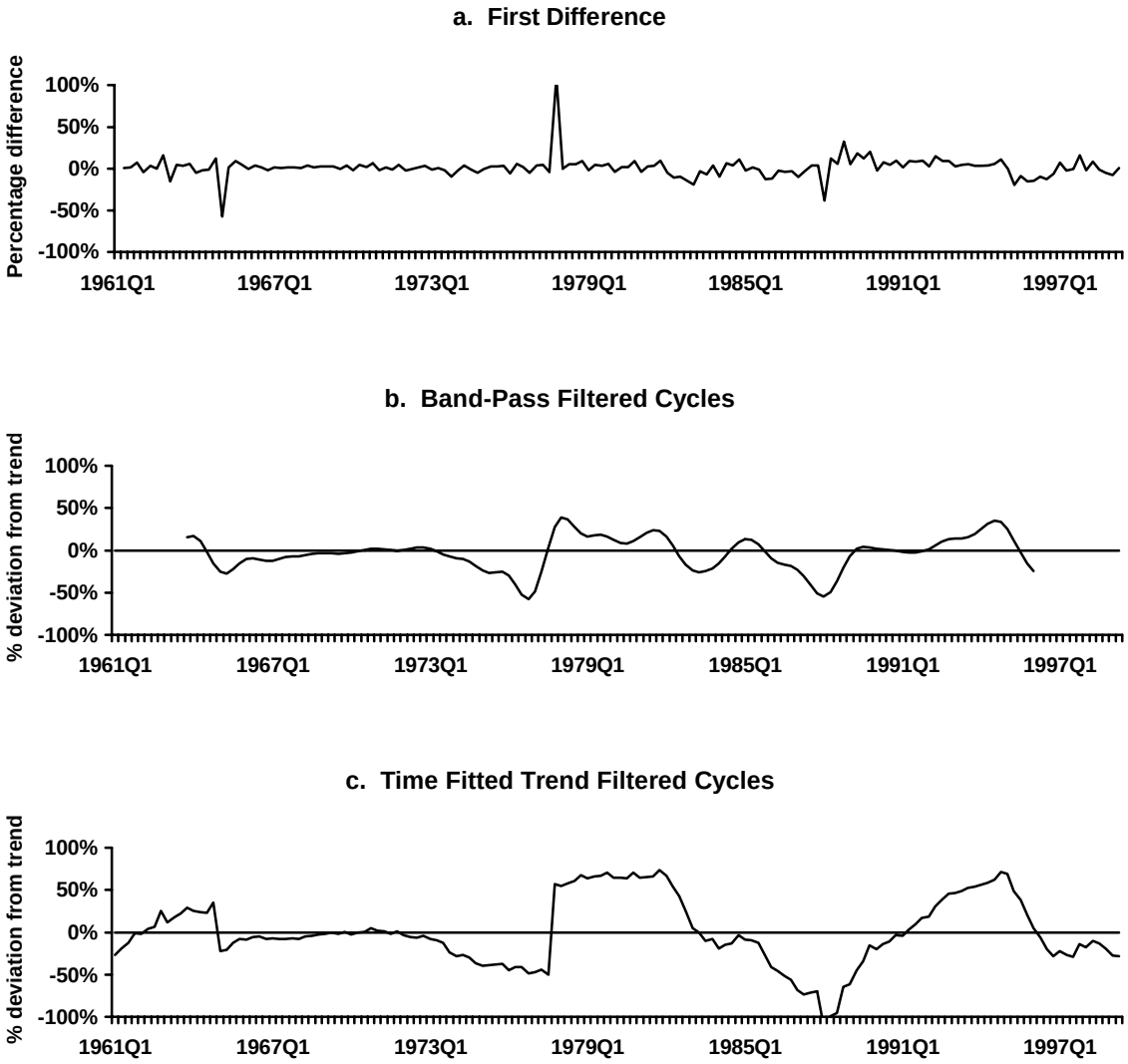
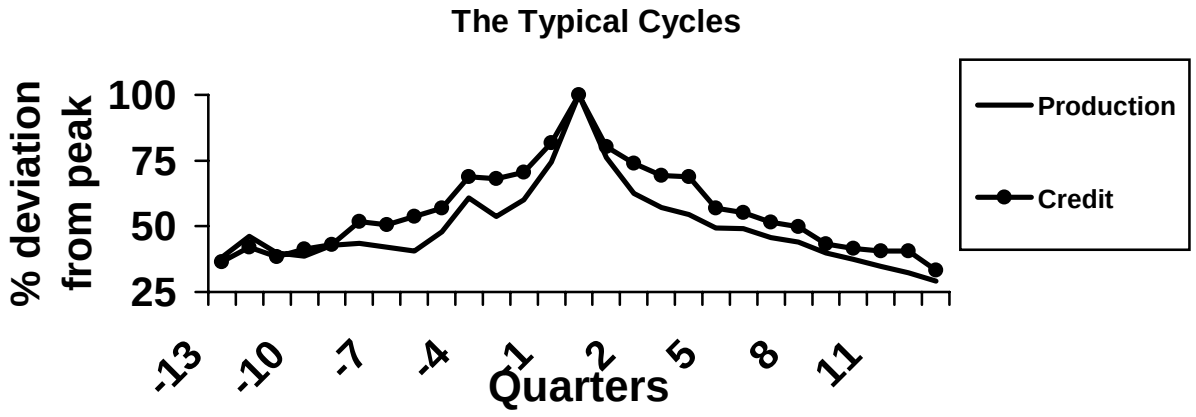
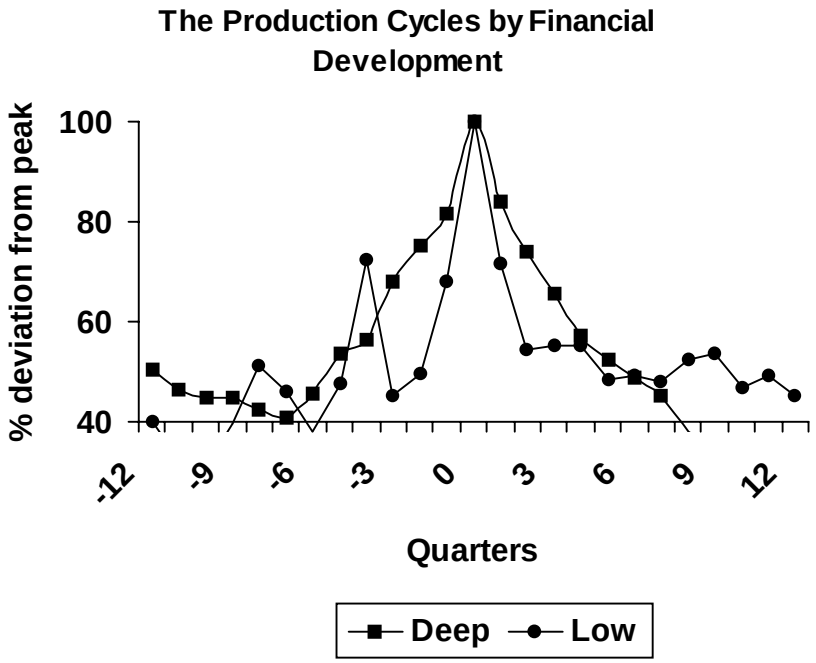


Figure 2: Production and Credit Cycles





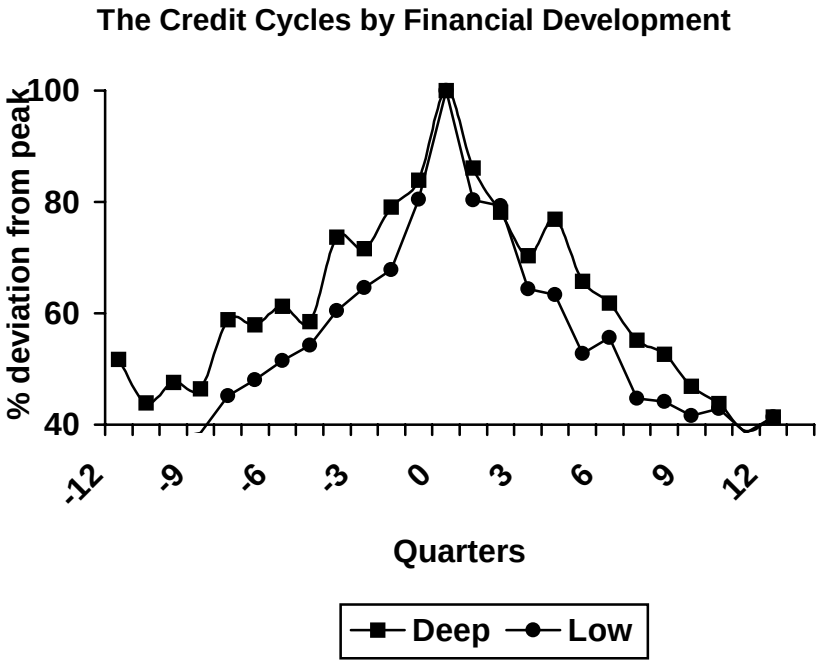


Figure 3:
Impulse Response Functions to a Shock in Stock Price by Financial Indices

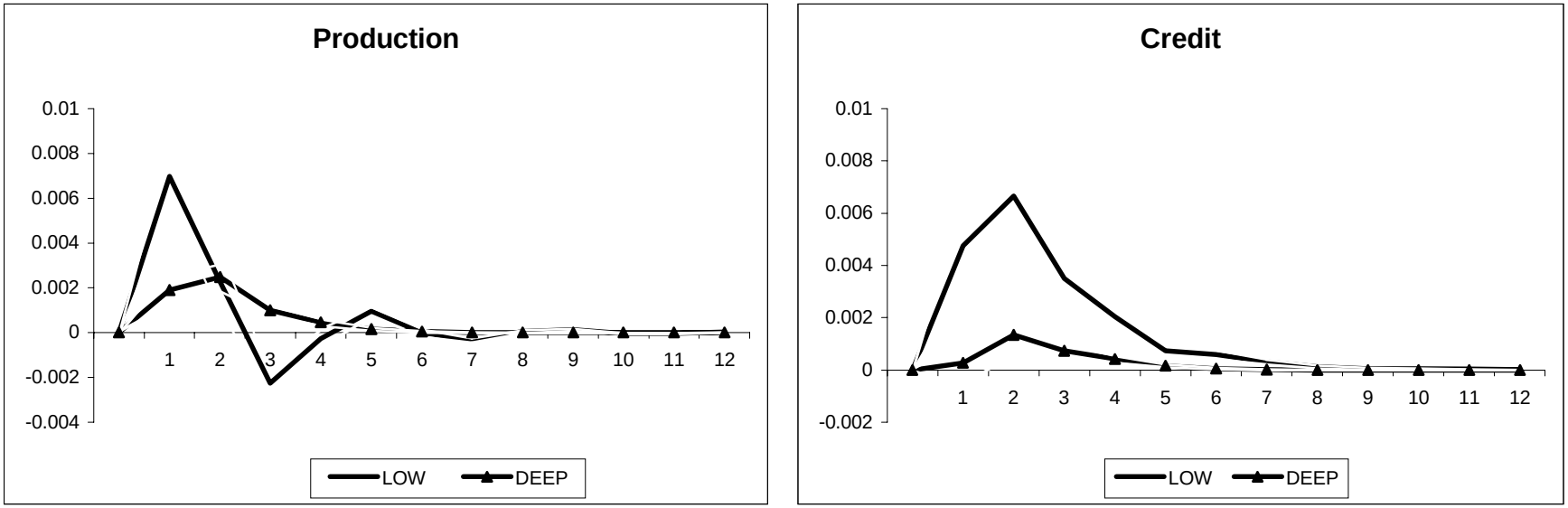
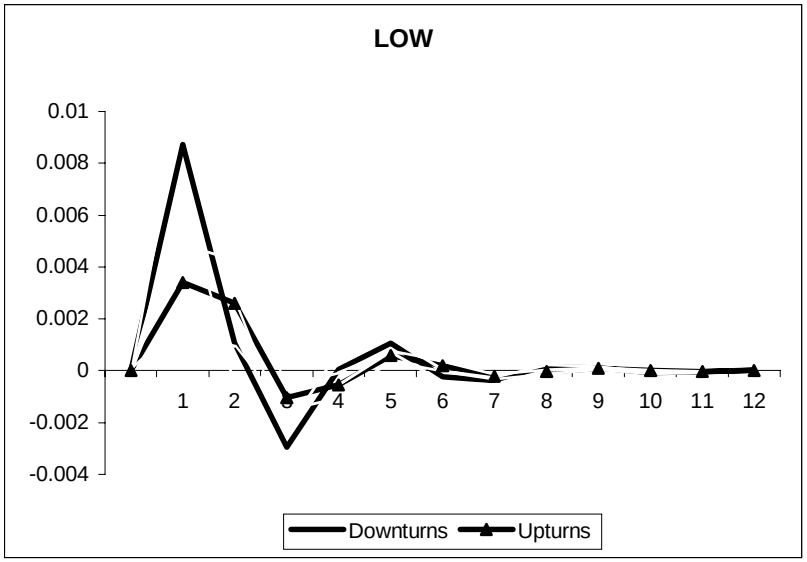


Table 7: Test of Equality on Stock Price Coefficients: Differential Effects Between LOW and DEEP (Wald linear restrictions)

	VAR Estimation Coefficients			Differential Test Result		
Shock to Stock price	**LOW**		**DEEP**	**Chi Squared**	**P-Value**	**Test Results**
	Lag	Coeff. (SE)	Coeff. (SE)			
Response of Production	1	0.05 (0.01) ***	0.02 (0.01) ***	3.81	0.148*	Responses of Low group are significantly larger than DEEP group.
	2	0.01 (0.01) *	0.02 (0.01) **			
Response of Credit	1	0.03 (0.01) ***	0.004 (0.01)	4.86	0.087**	Responses of Low group are significantly larger than DEEP group.
	2	0.03 (0.01) ***	0.014 (0.01)			

The standard errors are in parenthesis. *, **, and *** show significance levels at 10%, 5%, and 1% respectively.

Figure 4: Production
Asymmetric Impulse Response Functions to a Shock in Stock Price by Financial Indices



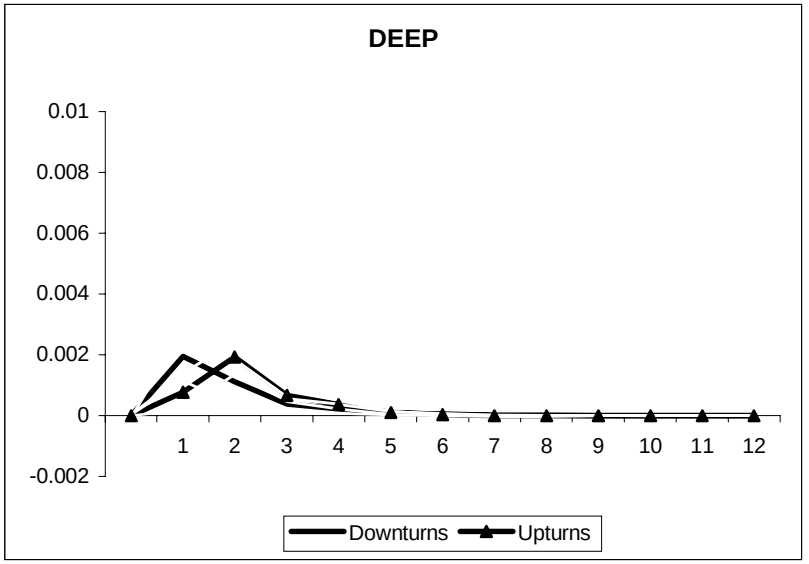
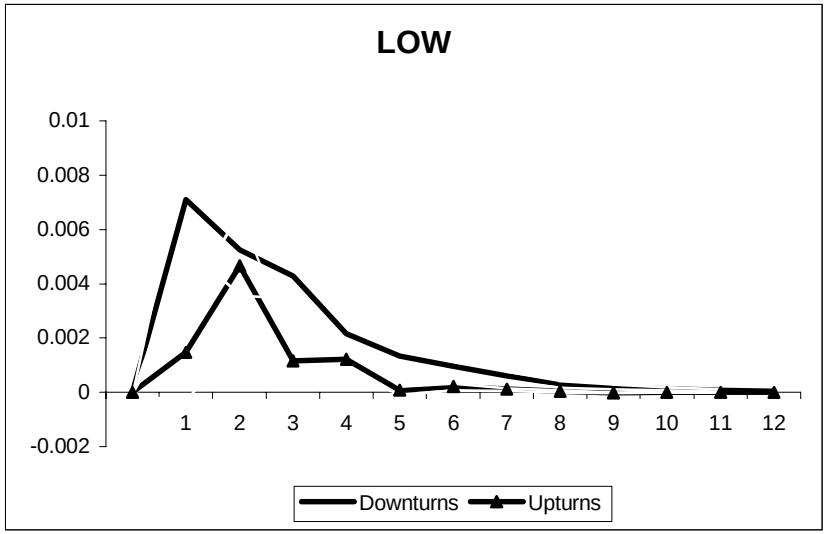


Table 8: Test of Equality on Stock Price Coefficients: Differential Effects Between Upturns and Downturns (Wald linear restrictions)

	VAR Estimation Coefficients			Differential Test Result		
Financial Development	**Downturns** Lag	Coeff. (SE)	**Upturns** Coeff. (SE)	**Chi Squared**	**P-Value**	**Test Results**
LOW	1	0.06 (0.01) ***	0.03 (0.01) ***	8.17	0.016 ***	Responses in downturns are significantly larger than in upturns.
	2	0.01 (0.01)	0.02 (0.01)			
DEEP	1	0.03 (0.01) ***	0.01 (0.01)	2.2	0.332	
	2	0.02 (0.01)	0.03 (0.01) ***			

The standard errors are in parenthesis. *, **, and *** show significance levels at 10%, 5%, and 1% respectively.

Figure 5: Credit
Asymmetric Impulse Response Functions to a Shock in Stock Price by Financial Indices



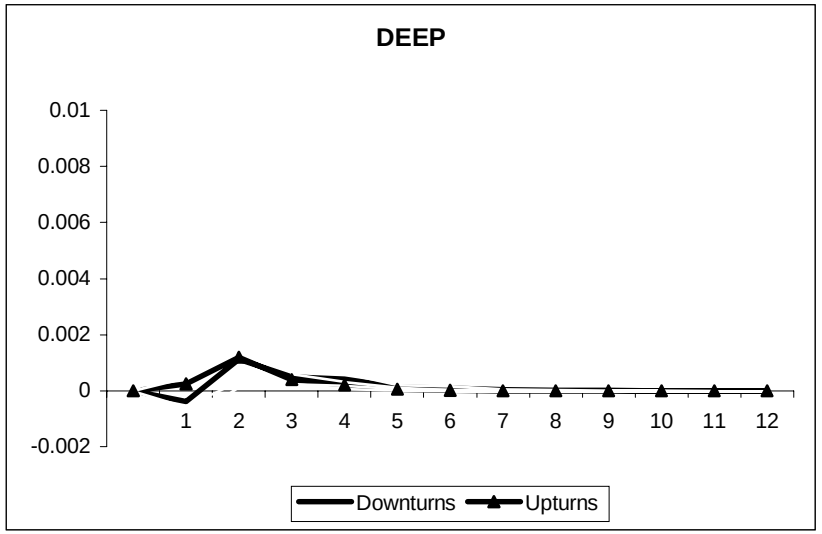


Table 9: Test of Equality on Stock Price Coefficients: Differential Effects Between Upturns and Downturns (Wald linear restrictions)

	VAR Estimation Coefficients			Differential Test Result		
Financial	**Downturns**		**Upturns**	**Chi Squared**	**P-Value**	**Test Results**
Development	Lag	Coeff. (SE)	Coeff. (SE)			
LOW	1	0.05 (0.01) ***	0.01 (0.02)	8.48	0.014 ***	Responses in downturns are significantly larger than in upturns.
	2	0.01 (0.01)	0.04 (0.02)			
DEEP	1	-0.006 (0.01)	0.005 (0.02)	0.74	0.692	
	2	0.015 (0.01)	0.019 (0.02)			

The standard errors are in parenthesis. *, **, and *** show significance levels at 10%, 5%, and 1% respectively.