Financial Fragility and Macroeconomic Performance
A Comparison of Emerging and Highly Developed Countries

Annamarie van der Zwet and Job Swank

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Corresponding author: Annemarie van der Zwet
e-mail: a.m.c.vanderzwet@dnb.nl

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Annamarie van der Zwet and Job Swank¹
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Abstract
This paper investigates the link between financial fragility and macroeconomic performance for three emerging countries (Korea, Malaysia and Mexico) and three highly developed countries (the United States, the United Kingdom and Germany). We explicitly examine the direction of causality and control for the robustness of the financial fragility indicators. Our empirical analysis suggests that the direction of causality mainly runs from financial fragility to economic growth and inflation. We also find that the positive effect of financial fragility on macroeconomic performance is much more important in the emerging countries than in the highly developed countries in our sample.

JEL-classification: E440.
Keywords: financial fragility, financial stability, macroeconomic performance, vector autoregression models, Wald-tests.

¹ Both authors work at the Nederlandsche Bank, PO Box 98, 1000 AB Amsterdam, the Netherlands. They thank Klaas Knot and Peter Vlaar for their comments.
I Introduction

The depth and spread of the Asian crisis, Russia's chaotic default on its debt, the resulting collapse of the hedge fund Long-Term Capital Management and the financial turmoil in Latin America have clearly heightened the interest in issues of financial stability last year. All this interest has resulted in several adjustments of the international financial architecture, such as the establishment of the Financial Stability Forum in February 1999, the pursuit of increased disclosure of financial data by countries and firms and the design of a new capital adequacy framework by the Basle Committee. With financial stability being so high on the agenda, one wonders what economic theory and empirical evidence have to say about the relationship between financial stability - or the opposite: financial fragility - and macroeconomic performance. Is financial stability so important indeed?

In recent years, a large body of literature has developed concentrating on the relationship between financial development and economic growth (see, for example King and Levine, 1993, De Gregorio and Guidotti, 1995, Odedokun, 1996, Levine, 1997, Arestis and Demetriades, 1997, Rousseau and Wachtel, 1998, Levine and Zervos, 1998, and Levine, Loayza and Beck, 2000). These empirically oriented papers all find a positive and significant relation between financial development and economic growth, generally using measures of the size of the banking sector and the stock market as indicators of financial development. However, on a priori grounds, the quality of financial intermediation appears at least as important for economic growth as its quantity. A large financial sector as such, e.g. as measured by the ratio of domestic credit to the private sector to GDP, can even be a sign of over lending and the emergence of an asset price bubble, with - eventually - negative effects on economic growth. In this paper we use a set of indicators which captures the concept of financial fragility more closely, namely the volatility of share prices, the volatility of the exchange rate and a variable characterising periods with banking crises or significant banking problems. Furthermore, we assess the influence of these indicators of financial fragility not only on economic growth, but also on inflation, as this is another important aspect of macroeconomic performance.

The literature on financial development and economic growth is plagued by two main problems, firstly concerning the direction of causality and secondly regarding the robustness of the variables involved. Because a two-way causation between financial development and economic growth is theoretically plausible, estimating a linear equation might be misleading. However, many authors simply assume that financial development influences economic growth and not vice versa, without examining the direction of causality first. As a short survey of the literature reveals that two-way causation is also possible for the link between financial fragility and macroeconomic performance (section 2), we explicitly investigate the direction of causality in this paper. This question is
addressed in section 3 in the context of vector autoregression models for three emerging countries (Korea, Malaysia and Mexico) and three highly developed countries (the United States, the United Kingdom and Germany), using monthly data over the period 1980-1998. This type of time-series analysis is better suited to perform causality tests than the cross-section analysis commonly used. The motivation for examining both highly developed and less developed, or emerging, countries is that economic relationships often vary more between highly developed and less developed countries than between individual countries within these groups. However, it should be noted from the outset that the choice for share price volatility as an indicator of financial fragility in combination with the analysis of less developed countries, severely limits our dataset. Conversely, indicators of the size of the financial sector – which are commonly used in the existing empirical literature – are available for a much larger number of less developed countries.

Particularly Levine and Renelt (1992) and Sala-i-Martin (1997) have drawn attention to the question of robustness. Both studies suggest that the effect of financial development on economic growth in cross-country regressions is not robust, because the sign or the significance (or both) of the coefficient of financial development is highly sensitive to different sets of control variables. In order to assess the robustness of the financial fragility indicators used in this paper, we need to include different sets of control variables. Because data on relevant control variables are not available on a monthly basis, we switch in section 3 to pooled regressions, using yearly data for emerging countries and highly developed countries respectively. A final section concludes.

II Theory

A financial system can be characterised as fragile when the banks are unsound or the financial markets are unstable, or both. It is apparent from this definition that two types of financial intermediaries are distinguished in this paper, namely banks and financial markets. Banks are defined as financial intermediaries which trade on their own account by borrowing from agents with savings surpluses and lending to agents with saving shortages. Banks are thus true asset transformers by changing the characteristics of funds with respect to scale, maturity and risk. The term financial markets refers to exchanges as well as the institutions that provide their services directly on these markets, e.g. investment banks, mutual funds and rating agencies.² Although

² It is common to make a distinction between asset transformers and other types of financial institutions, although the terminology varies between different authors. Bhattacharya and Thakor (1993) define two types of financial intermediaries, namely 'qualitative asset transformers' and 'brokers'. Boyd and Prescott (1986) only call true asset performers (commercial banks, thrift institutions, loan companies and so on) financial intermediaries and describe brokers, dealers and exchanges as arrangements for executing security transactions.
financial fragility thus has two dimensions, an unsound banking system and unstable financial markets will often go hand in hand. If banks are unsound, they are less capable to smooth financial markets by functioning as a counterpart for all types of transactions. Moreover, worries about the quality of the banking system can lead to a flight to quality by domestic depositors and overseas investors, with adverse effects on the stability of securities and foreign exchange markets. On the other hand, the risks associated with unstable financial markets can undermine the profitability and thus the soundness of the banking system.

The main channel from financial fragility to economic growth is allocative efficiency, that is the degree to which resources flow to the most productive uses. Financial intermediaries perform several functions, namely providing liquidity, supplying diversification facilities, selecting investment projects and exerting corporate control, which improve allocative efficiency, thereby stimulating economic growth. By providing liquidity, financial intermediaries ensure the continuation of consumption and investment expenditure in the face of financial setbacks, which reduces the necessity for households and firms to hold idle reserve assets, e.g. cash balances or gold. Financial intermediaries can also provide the risk-reducing benefits of diversification, by holding a portfolio of different types of assets and issuing less risky claims against it. In this indirect way, risky investments become available to a large group of risk-averse, small savers. A third function of the financial sector is the selection of investment projects; well-functioning financial markets contribute to the selection of the most productive investments by stimulating the production and distribution of information on the quality of firms among market participants, while banks issue claims in which this valuable information is embodied. Finally, financial intermediaries promote allocative efficiency by monitoring firms in order to ensure that firms are run in accordance with the interests of outside creditors (corporate control). When the financial system is fragile, the core functions of the financial system come under pressure, with presumably negative effects on allocative efficiency and economic growth.

Few would contest that a higher economic growth will improve the soundness of the banking system, mainly through an improved debt servicing capacity of firms, households and possibly even the government. Whether or not an increase in economic growth will contribute to the

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3 See Diamond and Dybvig (1983) for a formalisation of the function of banks in providing risk sharing between individuals with different liquidity needs. Financial markets provide liquidity by offering the opportunity to buy and to sell assets.

4 In the often cited model of Leland and Pyle (1977), banks and firms can only give a signal of their quality by retaining a sizeable fraction of their own equity. Because signalling by banks is more efficient than by each individual borrower, banks are in this model better positioned than markets to select investment projects.

5 Some authors point out the advantages of banks in monitoring firms, because they can realise economies of scale (Diamond, 1984) or because they have long-term relationships with banks (Mayer, 1998). However, other authors stress the merits of stock markets in evaluating firms. According to Allen (1993), banks are more able to monitor firms in less developed countries, whereas stock markets have an advantage in industrialised countries.
stability of financial markets is less clear; in the short term, the prices on these markets will probably become more volatile as they adjust to the higher growth path of the economy. However, in the medium and long term, we might expect a continuously strong economy to be characterised by relatively stable financial markets, because of an increase in investor confidence and a healthier banking system.

Relatively few existing theories explicitly address the connection between financial fragility and inflation. However, Lindgren, Garcia and Saal (1996) argue that an unsound banking system severely hampers the effective implementation of monetary policy, mainly because the normal relationships between policy instruments and target variables become less predictable and may be perverse in some cases. This is firstly caused by the diminished importance of the credit channel for monetary policy transmission, as credit availability will tend to become more dependent on bank capitalisation and less responsive to policy instruments. Secondly, factors such as a depositor flight to higher quality stores of assets often alter the demand for money (unstable money demand), which in turn hinder the monetary transmission through the money supply and interest rates. When the practical implementation of monetary policy is disrupted by a fragile financial sector, monetary authorities obviously lose their ability to ensure price stability. In some extreme cases, the central bank may also be tempted to forbearance in the conduct of monetary policy to support a weak financial system, with associated risks for price stability.6

Obviously, the relationship between financial fragility and inflation can also run the other way. A rising inflation accompanied by rising interest rates will affect the interest expenditures of the banking system probably faster than their interest revenues, due to the usual maturity mismatch (the maturity of banks' liabilities is generally shorter than the maturity of their assets). The financial strength of banks can also be undermined by the uncertainty associated with high inflation rates, which hampers the ability of banks to make optimal investment decisions. This uncertainty will probably also exert a negative influence on the stability of financial markets. Figure 1 sketches the main mechanisms of the presumably negative relationship between financial fragility and economic growth and positive correlation between financial fragility and inflation.

It should be noted that a direct relationship between growth and inflation in the form of the well-known Phillips-curve could blur the picture. In theory, we can imagine the following chain of events: less financial fragility stimulates economic growth (via more allocative efficiency), which exerts an upward pressure on prices (Phillips-curve), which in turn increases financial fragility.

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Figure 1 Sketch of theoretical links

again (because of the uncertainty associated with higher inflation levels). If this mechanism were relevant in practice, a durable improvement of financial soundness would be very difficult to achieve, because any decrease in financial fragility (partly?) undermines itself. However, the existence of a Phillips-curve depends crucially on "sticky" price expectations, which are presumably only relevant in the short-term. Nevertheless, it seems to be important to take into account the possible existence of a Phillips-curve, when empirically investigating the link between financial fragility and macro-economic performance.

III Empirical analysis

Indicators of financial fragility
Following the distinction made in the previous section, we use two types of indicators of financial fragility: the first capturing the instability of financial markets and the second capturing the unsoundness of the banking system. It is common practice to measure the instability of financial markets by means of the volatility of the prices on these markets. Because we are interested in comparing the interrelationship of financial fragility and macroeconomic performance between highly developed and less developed countries, the choice of financial markets to be considered is restricted by data availability. In particular, long series of comparable interest rates data hardly exist for less developed countries. However, quite long monthly series of share prices and the exchange rate can be found for some emerging countries, namely Korea Rep., Malaysia and Mexico. Unfortunately, monthly series on share prices for a period of, say, at least 10 years could not be found for a larger number of emerging countries, nor for transition economies. The data for Korea, Malaysia and Mexico are supplemented with monthly data on exchange rates and share prices of the United States, the United Kingdom and Germany. The volatility of share prices and
exchange rates is computed using the 12-month moving standard deviation of the first difference of the natural logarithm of these prices. Data on share prices are all taken from the International Financial Statistics (IFS) database of the International Monetary Fund, except that the share prices of Malaysia are not included in the IFS and therefore measured by the Kuala Lumpur Composite index. For all countries except the US we use the national currency to the dollar exchange rate, also from the IFS database. For the US we use the monthly nominal effective exchange rate instead.

Measuring the unsoundness of the banking system is much more problematic. Lindgren, Garcia and Saal (1996) define a sound banking system as one in which most banks (those accounting for most of the system’s assets and liabilities) are solvent and are likely to remain so. As these authors point out, the main problem is that the balance sheets of banks generally do not contain sufficient information to assess the current and the future development of solvency, mainly because the valuation of non-traded loans is often heavily influenced by subjective factors and data on off-balance sheet items are scarce. In addition, unsound banking systems tend to be characterised by poor accounting and loan valuation standards to mask the severity of the problems. As an alternative to balance sheet data, ratings of the financial strength of banks could be used, but these are hardly available for banks in emerging countries. So we are left with very interesting, but mainly qualitative databases on banking crises by Caprio and Klingebiel (1996) and Lindgren, Garcia and Saal (1996), which are filled with judgements of experts on country banking systems. These databases are transformed into a quantitative indicator by simply assigning a dummy value of 1 to periods characterised as ‘banking crisis’ or as ‘significant banking problems’, and a dummy value of 0 to all other periods. Of course, this is a rough indicator, since banking problems or crises are no binary events, but will gradually build up and ease again.

When we look at the indicators of financial fragility per country in the figures 2a and 2b, a few stylised facts can be observed. Firstly, financial markets of the highly developed countries are generally more stable than the financial markets of emerging countries in our sample (note the difference in scale). Another striking fact is that the volatility of the exchange rate and share prices of the highly developed countries do not seem to be higher in periods characterised by unsound banking systems than in other periods. Conversely, in the emerging countries considered, periods with unsound banking systems tend to coincide with periods with an increased volatility of share prices and the exchange rate. A possible explanation for this difference is that the problems by which banking systems of the emerging countries were confronted since 1980, were generally more

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7 Lindgren, Garcia and Saal (1996) make a distinction between ‘banking crises’ and ‘significant banking problems’. ‘Banking crises’ are defined as cases were runs or other substantial portfolio shifts, collapses of financial firms, or massive government intervention. Extensive unsoundness short of a crisis is termed ‘significant banking problems’. Due to practical reasons, we do not adopt this distinction.

8 This is the reason that Frydl (1999) finds significant differences in the timing of banking crises by different authors.
severe than the problems of the highly developed countries in our sample. To be concrete, the unsound banking system of Germany in the period 1990-1993 had to do with problems at state-owned banks following unification, and the well-known Savings&Loans Crisis in the US was concentrated in a specific sector of the US banking system. Compared to these more specific problems, the unsoundness of the banking systems of Korea, Malaysia and Mexico were more widespread. It follows that, at least in our sample, the financial sector of emerging markets is probably more fragile than the financial sector of highly developed countries.

Vector autoregression models using monthly data

In order to determine the direction of causality, we estimate a vector autoregression model for each of the countries selected, using seasonally adjusted monthly data covering the period 1980-1998. Because our variable characterising periods with unsound banking systems shows too little variability on a monthly basis, we can only include the volatility of the exchange rate and the volatility of share prices as indicators of financial fragility. Besides these financial fragility indicators, the vector autoregression (VAR) models for each country include the natural logarithm of industrial production, the consumer price index and the money stock, all taken from the International Financial Statistics database. Unit root tests suggest that share prices, the exchange rate, industrial production, the consumer price index and the money stock are integrated of order one (I(1)) for all countries studied. In order to get stationary series, we take first differences of all variables except the volatility of the exchange rate and share prices. We expect these last mentioned variables to be stationary already, since Baillie and Bollerslev (1989) have shown that, at least for monthly foreign exchange data, the variance (of the first difference of the national logarithm) is constant. This expectation proved to be true for each computed volatility, except for the volatility of the exchange rate and share prices of Korea and for the exchange rate of Malaysia. As it appeared from a sensitivity analysis that the results shown in table 1 are independent of the non-stationarity of these variables, we assume in what follows that all volatility measures are stationary nonetheless. Because Johansen tests indicate cointegration between industrial production, the consumer price index and the money stock for the UK and Korea, we add Vector Error Correction (VEC) terms in the VAR-models for these countries (see footnote 3 in table 1).

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5 We use two tests to determine the order of integration of the variables included, namely the Augmented Dickey-Fuller test and the Phillips-Perron test. We assume a variable to be I(0) if both or only one of these tests indicates a random walk, on the basis of the evidence found by Nelson and Plosser (1982) that macroeconomic time series are integrated of order one. Unit root tests for all variables can be obtained from the authors upon request.

6 The sensitivity analysis was carried out using a 3-month moving standard deviation of the first difference of the natural logarithm of the variables involved, which all turned out to be I(0). The results shown in table 1 did not change materially when using these 3-month moving standard deviations instead of 12-month moving standard deviations. These results can be obtained from the authors upon request.

10 For the other countries the Johansen test indicates no cointegrating equations. The Johansen tests are carried out on the assumption that series have means and linear trends but the cointegrating equations only have intercepts. Johansen tests for industrial production, the consumer price index and the money stock for the six countries in our sample can be obtained from the authors upon request.
Figure 2a  Indicators of financial fragility

Bold line = volatility of growth share prices\(^1\); Thin line = volatility of growth exchange rate\(^1\)

The shaded areas are periods characterised by banking crises or significant banking problems\(^2\)

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\(^1\) Volatility is measured by the 12-month moving standard deviation of the first difference of the natural logarithm of share prices and the exchange rate respectively.

\(^2\) Periods of banking crises and significant banking problems are defined by Lindgren, Garcia and Saal (1996). For the US, Caprio and Klingebiel (1996) are followed in attributing the significant banking problems in this country to a more concentrated period.
Figure 2b Indicators of financial fragility

Bold line = volatility of growth share prices; Thin line = volatility of growth exchange rate

The shaded areas are periods characterised by banking crises or significant banking problems.

1 Volatility is measured by the 12-month moving standard deviation of the first difference of the natural logarithm of share prices and the exchange rate respectively.

2 Periods of banking crises and significant banking problems are defined by Lindgren, Garcia and Saal (1996). The description 'mid-1980s' for the significant banking problems in Korea is interpreted as the period 1984-1986. The figures of Lindgren, Garcia and Saal (1996) are complemented by the more recent banking crises in Korea and Malaysia. For Mexico, Caprio and Klingebiel (1996) are followed in attributing the crises in this country to a more concentrated period.
Table 1  Relationship between financial fragility and macroeconomic performance on a monthly basis
F-statistics associated with Wald tests; * significant at the 5 percent level.

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimation Period</th>
<th>Volatility of growth share price or volatility of growth exchange rate</th>
<th>$dy = dy(dy_{t-12}, dp_{t-12}, c)$</th>
<th>$dp = dp(dy_{t-12}, dp_{t-12}, c)$</th>
<th>$V = V(dy_{t-12}, dp_{t-12})$</th>
<th>$V = V(dy_{t-12}, dp_{t-12})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>80:01 - 97:12</td>
<td>share price</td>
<td>0.80</td>
<td>1.27</td>
<td>0.82</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>exchange rate</td>
<td>1.23</td>
<td>1.21</td>
<td>0.55</td>
<td>0.67</td>
</tr>
<tr>
<td>UK</td>
<td>83:07 - 97:12</td>
<td>share price</td>
<td>1.17</td>
<td>1.07</td>
<td>0.53</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>exchange rate</td>
<td>0.52</td>
<td>0.49</td>
<td>2.27*</td>
<td>0.97</td>
</tr>
<tr>
<td>Germany</td>
<td>80:01 - 97:05</td>
<td>share price</td>
<td>0.61</td>
<td>0.97</td>
<td>0.24</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>exchange rate</td>
<td>1.26</td>
<td>1.35</td>
<td>0.92</td>
<td>1.43</td>
</tr>
<tr>
<td>Korea</td>
<td>81:03 - 98:09</td>
<td>share price</td>
<td>0.99</td>
<td>2.45*</td>
<td>0.66</td>
<td>1.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>exchange rate</td>
<td>1.95*</td>
<td>2.86*</td>
<td>0.93</td>
<td>0.41</td>
</tr>
<tr>
<td>Malaysia</td>
<td>82:01 - 98:08</td>
<td>share price</td>
<td>1.02</td>
<td>1.22</td>
<td>0.45</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>exchange rate</td>
<td>2.45*</td>
<td>1.24</td>
<td>0.47</td>
<td>1.08</td>
</tr>
<tr>
<td>Mexico</td>
<td>86:01 - 97:09</td>
<td>share price</td>
<td>1.13</td>
<td>7.27*</td>
<td>0.66</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>exchange rate</td>
<td>1.56</td>
<td>1.13</td>
<td>0.52</td>
<td>1.98*</td>
</tr>
</tbody>
</table>

$dy = \text{growth of industrial production}; dp = \text{inflation}; dm = \text{growth of money}; v = \text{volatility of share prices or the exchange rate}; c = \text{a constant}.$

$2$ Volatility is defined by the 12-month moving standard deviation of the first difference of the natural logarithm of the variable involved.

$3$ For the US, Germany, Malaysia and Mexico unrestricted VAR-models are are estimated. Because Johansen-tests indicate cointegration between $y, p$ and $m$ for the UK and Korea, the following VEC-terms are added in the equations for these countries: $y_{t-1} - 0.48p_{t-1} - 0.02m_{t-1} - 2.27$ (UK) and $y_{t-1} + 4.54p_{t-1} - 2.09m_{t-1} - 2.11$ (Korea).
Since 12 lags are included in the VAR-models, we can test the assumption \((H_0)\) that financial fragility has no influence on macroeconomic performance by means of a Wald test on the 12 coefficients of the lagged volatility of share prices and the exchange rate in the equations for economic growth and inflation for each country. The question of reverse causality is investigated by performing Wald tests on the coefficients of economic growth and inflation in the equations explaining the volatility of share prices and the volatility of the exchange rate. Note that these Wald tests are more encompassing than bivariate Granger causality tests, because they control for the influence of other variables included in the VAR-models. It follows from table 1 that financial fragility hardly influences the macroeconomic performance in the US, the UK and Germany and vice versa, because all null hypotheses for these countries cannot be rejected, except the influence of economic growth on the volatility of the exchange rate in the UK. However, in all the three emerging countries considered, there appears to be a significant influence from financial fragility on economic growth and/or inflation. The volatility of the exchange rate significantly affects economic growth and inflation in Korea, and economic growth in Malaysia, while the volatility of share prices contributes to the explanation of inflation in Korea and Mexico. The emerging countries analysed are in one way comparable to the highly developed countries considered, since there is only one equation in which the null hypothesis of no reverse causality cannot be rejected (the influence of inflation on the volatility of the exchange rate in Mexico). It should be noted that these results are not distorted by the existence of a Phillips-curve, as Wald-tests on the effect of economic growth on inflation and vice versa do not point to a (robust) relationship between these two dimensions of macroeconomic performance. We therefore conclude that in emerging countries the direction of causality mainly runs from financial fragility to macroeconomic performance, whereas there is hardly any evidence of correlation between financial fragility and macroeconomic performance in highly developed countries.

One objection against this line of reasoning is that the Wald tests as used in this paper, just like Granger causality tests, only say that financial fragility precedes a worse macroeconomic performance in emerging countries. However, precedence does not by itself indicate causality in the more common sense of the term. Rajan and Zingales (1998) argue for example that financial development may predict economic growth simply because financial markets anticipate future growth; the stock market capitalises the present value of growth opportunities, while financial institutions lend more if they think the economy will pick up. A comparable mechanism might explain the observed correlation between financial fragility and macroeconomic performance in emerging countries. It is plausible that the expectation of a downturn of the economy combined with mounting inflation, e.g. as a result of a shift towards a less credible macroeconomic policy by a new government, will destabilise financial markets. In this way, volatile financial markets could
occur before the deterioration of macroeconomic performance actually materialises, while they are essentially the result of it. However, if the causality would indeed run this way, we could only statistically find that financial fragility precedes a worse macroeconomic performance if the expectations of economic subjects turn out to be true on average. This last condition can not be taken for granted, as unexpected economic shocks often blur the picture.

Pooled regressions using yearly data

Now that the direction of causality has been established, we try to estimate the effect of financial fragility on macroeconomic performance on the basis of yearly data over the period 1980-1997. The advantages of switching to yearly data is that we can include our dummy indicating banking unsoundness as well as a richer array of control variables. The inclusion of these last variables is necessary to assess the robustness of the influence of financial fragility on macroeconomic performance, that is the dependence of this statistical result on the specification of the estimated equations. As was mentioned in the introduction, Levine and Renelt (1992) and Sala-i-Martin (1997) have drawn attention to the fact that the effect of the variables put forward in the literature to affect economic growth, such as a variety of economic policy, political and institutional indicators, is highly sensitive to different sets of control variables. In this paper, we include as control variables the ratio of foreign trade to GDP (trade/y), the ratio of public spending to GDP (gov/y), the ratio of capital formation to GDP (inv/y) and the ratio of domestic credit to the private sector to GDP (cred/y). These variables are added in different sets to the basic equations of inflation and economic growth estimated in the last section, the main differences being that the 12 monthly lags are replaced by one yearly lag and that real GDP is substituted for industrial production. In order to increase the degrees of freedom, we pool the data of the highly developed countries to estimate one set of equations and the data of the emerging markets to estimate another set of equations. This solution seems to be justified, given that the monthly analysis in table 1 shows a clear resemblance between different highly developed countries and between different emerging countries with respect to the link between financial fragility and macroeconomic performance.

The results of the empirical analysis using yearly data are presented in table 2a for the highly developed countries and in table 2b for the emerging countries. It follows from table 2a that most of the types of financial fragility considered, including banking unsoundness, do not significantly affect the macroeconomic performance of the group of highly developed countries (note that the estimated coefficients even have the wrong sign in most cases). Furthermore, table 2b broadly confirms the conclusion drawn from the monthly analysis that financial fragility matters for the macroeconomic performance of emerging countries. This holds in particular for the instability of foreign exchange markets, which significantly influences both economic growth (negative sign)
Table 2a Effect of financial fragility on macroeconomic performance of highly developed countries

Pooled regression on the basis of yearly data from the US, the UK and Germany from 1980 – 1997, if available. Significance of coefficients in the table determined by White heteroskedasticity-consistent t-statistics; * significant at the 2½ percent level (one-tailed test)

<table>
<thead>
<tr>
<th>Indicator of financial fragility</th>
<th>No. Obs.</th>
<th>Coefficient</th>
<th>Adjusted R²</th>
<th>dy = dy(dy_{t-1}, dp_{t-1}, dm_{t-1}, c)¹</th>
<th>No. Obs.</th>
<th>Coefficient</th>
<th>Adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>v = vol. of growth share prices</td>
<td>48</td>
<td>-9.84</td>
<td>0.29</td>
<td>dy = dy(dy_{t-1}, dp_{t-1}, dm_{t-1}, c)¹</td>
<td>48</td>
<td>1.19</td>
<td>0.73</td>
</tr>
<tr>
<td>v, trade/y, gov/y, inv/y</td>
<td>46</td>
<td>-9.18</td>
<td>0.28</td>
<td>dp = dp(dy_{t-1}, dp_{t-1}, dm_{t-1}, c)</td>
<td>46</td>
<td>1.02</td>
<td>0.71</td>
</tr>
<tr>
<td>v, cred/y, gov/y, inv/y</td>
<td>46</td>
<td>-9.16</td>
<td>0.32</td>
<td></td>
<td>46</td>
<td>1.80</td>
<td>0.71</td>
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¹ dy = growth of real GDP; dp = inflation; dm = growth of money; v = volatility of growth of share prices or growth of exchange rate; c = a constant; trade/y = ratio of foreign trade to nominal GDP; gov/y = ratio of public spending to nominal GDP; inv/y = ratio of capital formation to nominal GDP; cred/y = ratio of domestic credit to the private sector to nominal GDP.
Table 2b  Effect of financial fragility on macroeconomic performance of emerging countries

Pooled regression on the basis of yearly data from Korea, Malaysia and Mexico from 1980 – 1997, if available.
Significance of coefficients in the table determined by White heteroskedasticity-consistent t-statistics;
* significant at the 2½ percent level (one-tailed test)

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<th>Indicator of financial fragility</th>
<th>No. Obs.</th>
<th>dy = dy(dy_{-1}, dp_{-1}, dm_{-1}, c)</th>
<th>Adjusted R²</th>
<th>dp = dp(dy_{-1}, dp_{-1}, dm_{-1}, c)</th>
<th>No. Obs.</th>
<th>Coefficient</th>
<th>Adjusted R²</th>
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<td>54</td>
<td>201.84*</td>
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<td>&quot;</td>
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<td>0.47</td>
<td>&quot;</td>
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<td>0.85</td>
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<td>4.08</td>
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1 dy = growth of real GDP; dp = inflation; dm = growth of money; v = volatility of growth of share prices or growth of exchange rate; c = a constant; trade/y = ratio of foreign trade to nominal GDP; gov/y = ratio of public spending to nominal GDP; inv/y = ratio of capital formation to nominal GDP; cred/y = ratio of domestic credit to the private sector to nominal GDP.
and inflation (positive sign). The volatility of share prices significantly affects inflation (positive sign), but appears to be irrelevant for economic growth. The dummy for banking problems always has the right sign, but is insignificant, which is probably due to the roughness of this indicator.

IV Concluding remarks

The conclusions of this paper are that (1) in the emerging countries studied, the direction of causality mainly runs from financial fragility to inflation and economic growth and hardly the other way around and (2) financial fragility matters more for the emerging countries than for highly developed countries in our sample. The first conclusion qualifies the studies by Demirgüç-Kunt and Detragiache (1998) and by Hardy and Pazarbasioğlu (1998), which try to identify the determinants, or leading indicators of banking crises. These studies conclude that periods with banking distress are associated with a contemporaneous fall in economic growth and a high inflation, among other variables. Our analysis suggests that a low GDP growth and a high inflation are probably not very suitable as leading indicators for banking distress, because there is more evidence for the position that these variables are the result than that they are the cause of financial fragility in Korea, Malaysia and Mexico.

What can explain the conclusion of this paper that financial fragility is probably more important for the macroeconomic development in emerging countries than in highly developed countries? A first explanation focuses on the fact that the main distinction between the group emerging countries and the group highly developed countries is the influence of the volatility of the exchange rate on inflation and economic growth. After all, the differences in the effects of the volatility of share prices and the banking problem-dummy between both groups are less clear-cut. A straightforward explanation of these stylised facts is that the emerging countries in our sample are characterised by a much higher foreign debt as a percentage of GDP than the highly developed countries. Although the foreign debt of the US has risen steeply during the nineties (to more than 10% of GDP), it is still not comparable to the indebtedness of Korea, Malaysia and Mexico (varying between 30-50% of GDP). An increased volatility of the exchange rate might well cause a reluctance on the side of foreign investors to finance the external position, which is of course more harmful for countries that depend more on foreign capital.

A more encompassing explanation follows from the observation made earlier, that the financial sector of emerging countries is probably more fragile than the financial sector of highly developed countries. If this is true, there might be a traditional 'diminishing marginal returns'-mechanism at work here; the sounder the financial system already is, the less impact an increasing soundness has on the macroeconomic performance of a country. This explanation is in line with the empirical findings of Odedokun (1996) and De Gregorio and Guidotti (1995). The latter authors conclude that the growth-enhancing effects of the size of the banking
sector are more predominant in low-income countries than in high-income countries, while Odedokun finds that financial development is more important in low-income developing countries than in high-income developing countries. Thus, it might be that the quantity as well as the quality of the financial sector are subject to diminishing marginal returns.
References


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