Cross–country Convergence of Financial Reforms

Jac C. Heckelman a *

a Wake Forest University, 122 Carswell Hall, Winston-Salem, NC 27109 USA
* Corresponding information; Email: heckeljc@wfu.edu

ARTICLE INFO

Article history:
Received 21 April 2013
Accepted 5 May 2013
Available online June 2013

JEL classification:
G15
G28
O16

Keywords:
Convergence
Financial liberalization
Standard deviation
Coefficient of variation

ABSTRACT

Financial liberalization indicators are tested for sigma convergence and divergence. Sigma convergence requires a significant reduction in the dispersion across nations over time whereas sigma divergence entails a significant increase in dispersion. Using the standard deviation and a linear trend, sigma divergence is supported for an index of capital accounts openness, but sigma convergence is supported for an index of domestic financial sector liberalization. Using instead the coefficient of variation, which accounts for the upward trend in each of the measures, strong evidence is found in support of sigma convergence for both measures. This latter result holds for both advanced and developing nations.

1. Introduction

Increased globalization has resulted in more coordination among central governments and pressures to conform. As a result, the past few decades have witnessed greater conformity in the institutional arrangements across countries. Several recent studies have supported this view. Basu (1999) details the increased standardization of child labor laws. Nieswiadomy and Strazicich (2007) report that the variation in political freedoms is significantly falling across a sample of 136 countries rated by Freedom House. In the most comprehensive study, Grier and Grier (2007) find that government spending, openness to trade, corruption, bureaucratic quality, rule of law and political constraints on the executive, are all converging across a large sample of rich and developing nations. In contrast, they found that financial markets are not converging. In particular, financial development (as measured by private credit relative relative to GDP) and openness to international capital inflows (proxied by the Chinn and Ito (2006) index) are significantly diverging. Thus, among the various institutional arrangements, divergence across the financial sectors appears to be an outlier.

We present new evidence that financial reforms are generally converging in contrast with the evidence from Grier and Grier. This is done two ways. First, although we corroborate their findings when using their measure of financial reforms, a new index of financial liberalization capturing reforms to the domestic sector is also employed. This alternative index shows evidence of convergence. Second, we argue the Grier and Grier result is dependent on relying on the standard deviation as the measure of dispersion. The standard deviation is increasing over time due to an underlying upward trend in the index. Using instead the coefficient of variation as an alternative measure of dispersion, which is unit-free and directly accounts for the upward trend in each financial indicator, we find that each of the policy measures are converging across nations.

2. Comparison of measures of financial markets

Grier and Grier (2007) analyze multiple measures of institutions. Their measure for financial policy is the capital account openness index (CAOI) developed by Chinn and
Ito (2006). The CAOI utilizes the first principal component from four dummy variables measuring

- the presence of multiple exchange rates;
- restrictions on current account transactions;
- restrictions on capital account transactions;
- the requirement of the surrender of export proceeds.

The CAOI primarily captures the existence of various international restrictions, and thus financial integration into the global economy. It thus represents a measure of financial liberalization for international capital flows.

The CAOI can be contrasted with another financial liberalization index (FLI), described in Abiad et al. (2008), which rates each country from a scale of 0–3 on seven dimensions for

- capital account restrictions;
- credit controls and excessively high reserve requirements;
- interest rate controls;
- entry barriers;
- prudential regulations and supervision of the banking sector;
- state ownership in the banking sector;
- securities market policy.

The FLI score is the simple summation of the seven category ratings. The FLI differs in several aspects from the CAOI. Although the FLI includes capital account restrictions, it rates the intensity of the restrictions rather than just the presence of restrictions. However, this is only one of seven dimensions and therefore carries a smaller weight in the final index. In addition, the other six dimensions do not directly address international capital flows. Thus, the focus of the FLI relies more heavily on the domestic financial sector.

The FLI we use is an updated and expanded version of the original index created by Abiad and Mody (2005). The current index covers up to 91 countries from 1973–2005. Vietnam and 17 transition economies are not included in the FLI database until 1990 or later. Coverage for China does not begin until 1981. For consistency, we exclude these nations from the sample in order to balance the panel.

There is a definitive upward trend suggesting greater liberalization over time. The average liberalization score increased almost four-fold, ranging from a low of 4.4 in 1973 and reaching 16.5 in 2005.

For comparison, average values for the CAOI series over the same time span are plotted in Figure 2. The CAOI also shows a rising trend over time, with the sample average increasing by 75% over the 32 year interval. In the next section, we seek to determine if these increased average values for financial reforms represent convergence or divergence among the sample nations.

There are a variety of ways to identify convergence. In a cross-sectional setting, beta convergence requires an inverse correlation between the initial value and its subsequent growth rate over time. Such a relationship suggests nations are ‘catching-up’ to each other. Sigma convergence requires an inverse correlation between the variation in values and a time trend. Such a relationship indicates that the dispersion of the values are falling over time. Furceri (2005) shows beta convergence is a necessary but not sufficient condition for sigma convergence.

Grier and Grier (2007) perform standard sigma convergence tests by regressing a measure of dispersion across countries against an intercept and time trend. Sigma convergence is represented by a negative coefficient on the trend term, and sigma divergence is represented by a positive coefficient on the trend term.

### 3.1. Estimating dispersion by standard deviation

Grier and Grier (2007) perform simple OLS regressions using the standard deviation (std) as the measure of dispersion. We found the standard deviation of each series exhibits strong serial correlation in which case OLS would yield inconsistent estimates and potentially spurious relationships. Instead, in Table 1 regression estimates are presented using the Newey-West HAC ‘sandwich’ estimator with Bartlett bandwidth robust to serial correlation. We find the coefficient for the time trend to be positive and significant for the CAOI, consistent with Grier...
and Grier. Thus, based on this measure of financial liberalization, we would conclude as they did that financial reforms are diverging. However, in regards to FLI, the coefficient on the time trend is negative and statistically significant. In contrast to divergence of reforms to the openness of capital accounts, dispersion in liberalization of the domestic financial sector appears to be significantly decreasing. Thus, initial conclusions regarding convergence of financial liberalization depend on whether one is referring to international restrictions or domestic sector reforms.

Table 1 – Time trend regressions for standard deviation, 1973–2005

<table>
<thead>
<tr>
<th>Financial measure</th>
<th>CAOI</th>
<th>FLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>intercept</td>
<td>1.28* (65.22)</td>
<td>5.13* (12.27)</td>
</tr>
<tr>
<td>time trend</td>
<td>0.010* (0.64)</td>
<td>-0.036* (-1.87)</td>
</tr>
<tr>
<td>regression std</td>
<td>0.084</td>
<td>0.733</td>
</tr>
<tr>
<td>error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of countries</td>
<td>101</td>
<td>72</td>
</tr>
</tbody>
</table>

Notes: HAC t-statistics robust to serial correlation in parentheses. * significant at 10%

3.2. Estimating dispersion by coefficient of variation: A common alternative measure of dispersion is the coefficient of variation (cv), used by, for example, Annala (2003), Greasley and Madsen (2006), Nieswiadomy and Straizic (2007), and Studer (2008) in their tests of sigma convergence for state and local fiscal policies, total factor productivity, political freedoms, and prices, respectively. They typically do not explain their choice of measure but it may be due to the rising trend in the series they study. A trending mean may make the std problematic for measuring dispersion. As previously shown in Figures 1 and 2, index values for both of the financial liberalization measures have also been trending upward. The standard deviation measures the average absolute gap relative to the mean. Thus, it is unit-dependent. Specific values for the stds for CAOI and FLI depend on whether and how the indexes are normalized. Making comparisons across indicators becomes difficult even though the actual underlying dispersion in any given year is independent of any arbitrary scaling factor. However, the scale effect for any given indicator is accounted for by comparing the stds over time. Thus the particular scaling technique should not affect significance of the trend terms from the regressions presented in Table 1. Yet, a further problem arises because the mean value is increasing over time. Recall that beta convergence implies the growth rate should be inversely correlated to initial positions. Sigma convergence measured by the std is not consistent with this concept because it relies on absolute, rather than percent changes. The stds will increase even if the scores increase by the same percentage for every nation. Thus, stds will be biased upward when financial liberalization occurs. This biases against a finding of sigma convergence and toward a finding of sigma divergence. The cv, computed as the std divided by the mean, accounts for the distinction. By dividing through by the mean, the cv is not unit-dependent and automatically adjusts for any underlying trend in the mean. In essence, the cv measures the std as a percentage of the mean and is not affected by whether or not the data have been normalized. It may be especially important to use a unit-independent measure in order to better relate the mathematical concept of dispersion to the economic phenomena of convergence.

Therefore, the evidence of sigma divergence found in the previous section and by Grier and Grier (2007) may simply be artifacts of the units. Because the cv is unit-free and makes sigma convergence more consistent with the notion of beta convergence, the cv will now be used instead of the std to test for convergence in financial liberalization. The time trend coefficients, reported in the first two columns of Table 2, are negative and statistically significant for both CAOI and FLI. Thus, there is strong evidence of sigma convergence in financial markets when using the cv instead of the std. Comparing directly, the intercepts are very similar suggesting the initial extent of dispersion was roughly equivalent for the two policy measures once the different scales on which they are based are taken into account. Yet the magnitudes on the time trend coefficients indicate the rate of convergence is occurring almost three times as rapidly for reforms to the domestic financial sector than for international accounts. Grier and Grier (2007) also found that although countries were generally diverging in their degree of openness reforms (using the std), this result was only confirmed in the subsample of developing countries. In the subsample limited to rich countries, convergence was found. Thus divergence within the full sample may have been due to the dominance of the sample by developing countries which comprised three times as many observations as the rich countries. Similarly, Abiad et al. (2008) show the average FLI among the advanced nations is consistently higher than for the other regions, and the averages for the other regions are relatively similar to each other. As a final exercise, we determine if convergence of each measure using the cv holds for the separate subsamples of advanced and developing nations. The results are reported in the last four columns of Table 2. Regarding both reform indexes, the time trend is always negative and statistically significant indicating that advanced countries are becoming more similar to each other, and developing countries are also becoming more similar to each other. For the CAOI, convergence is occurring at twice the rate among the advanced countries compared to the developing countries. The reverse is true for the FLI. We conclude overall that financial reforms are generally converging.

Notes:

2 We also used the private credit ratio (PCR) from Beck et al. (2000) to replicate Grier and Grier's results for financial development. Signs and significance on regression estimates for PCR mirror those of CAOI throughout. Results are available upon request.

3 See also Skidmore et al. (2004), Laurini et al. (2005), Heckelman (2008), and Liddle (2009). Some studies use both the standard deviation and coefficient of variation in their tests. Examples include Ram (2006) and Deheja and Samy (2008).

4 Because the time trend starts with a value of 1, the initial dispersion values can be estimated by adding the time trend coefficient to the intercept. They are estimated as 0.98 and 1.01 for CAOI and FLI, respectively. (Actual initial cv values are .91 and .92.)
Table 2 – Time trend regression for coefficient of variation

<table>
<thead>
<tr>
<th>Financial measure</th>
<th>CAOI Full</th>
<th>FLI Full</th>
<th>CAOI Advanced</th>
<th>FLI Advanced</th>
<th>CAOI Developing</th>
<th>FLI Developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intercept</td>
<td>0.99*</td>
<td>1.04*</td>
<td>0.76*</td>
<td>1.07*</td>
<td>0.59*</td>
<td>1.23*</td>
</tr>
<tr>
<td></td>
<td>(-20.96)</td>
<td>(-30.91)</td>
<td>(-28.97)</td>
<td>(-17.75)</td>
<td>(-36.64)</td>
<td>(-26.60)</td>
</tr>
<tr>
<td>time trend</td>
<td>-0.010*</td>
<td>-0.028*</td>
<td>-0.021*</td>
<td>-0.010*</td>
<td>-0.019*</td>
<td>-0.035*</td>
</tr>
<tr>
<td></td>
<td>(-5.24)</td>
<td>(-17.42)</td>
<td>(-17.30)</td>
<td>(-4.09)</td>
<td>(-15.61)</td>
<td>(-15.46)</td>
</tr>
<tr>
<td>regression std error</td>
<td>0.084</td>
<td>0.071</td>
<td>0.059</td>
<td>0.107</td>
<td>0.042</td>
<td>0.095</td>
</tr>
<tr>
<td>Number of countries</td>
<td>101</td>
<td>72</td>
<td>21</td>
<td>80</td>
<td>22</td>
<td>50</td>
</tr>
</tbody>
</table>

Notes: HAC t-statistics robust to serial correlation in parentheses. * significant at 10%.

4. Conclusion

Past studies have tended to find evidence of international convergence for various institutional measures. Gri er and Grier (2007) are an exception by showing sigma divergence regarding an index of financial liberalization. The index they use captures international integration through the openness of capital accounts. An additional liberalization index used here represents reforms to the domestic financial sector. Using the standard deviation as a measure of dispersion, divergence regarding openness of capital accounts is confirmed but reforms on the domestic financial sector are found to be converging across countries. Using instead the coefficient of variation to measure dispersion, which adjusted for the overall upward trend in each series, sigma convergence is strongly supported for both liberalization indexes. In addition, sigma convergence is also found within subsamples of advanced nations and developing nations. Thus, sigma divergence of the financial sector is generally not supported but rather sigma convergence appears to be the norm. Given the primacy some scholars have placed on financial reforms for attracting investment and sustaining growth in the developing countries (Omran and Bobol, 2003; Yang and Yi, 2008), the apparent increasing policy standardization should help to achieve these goals.

References