

Country Risk and Early Warnings on Contagion

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Sylvain Barthélémy
Research Director, TAC
barth@tac-financial.com

Sandrine Lunven
Economist, TAC
lunven@tac-financial.com

Abstract – *The large number of financial crisis observed over the past fifteen years on developing countries and emerging markets has monopolized many academic and financial institutions. They try to analyze, model and predict future financial crises by using different combination of economic, political and institutional indicators through complex statistical procedures. TAC is providing a proprietary country risk assessment system for more than 15 years: RiskMonitor. Riskmonitor is using a combination of macroeconomic indicators and a non parametric composite classification model. It allows to construct early warning signals on more than 60 countries and to predict financial crises in emerging markets up to five years in advance with an unmatched performance. But more than the financial crises themselves, their potential contagion to other countries is a key issue that is usually neglected by country risk analysis. In term of investment strategy for example, the ability to evaluate the potential of contagion across different countries of a portfolio would be a key element for the international diversification. Then, and in order to improve the quality of the crisis signals provided, the TAC research team has started an in-depth research on contagion and is working on a major improvement of the Riskmonitor system through the development of a new tool to detect contagion effect in emerging countries before their occurrence. The aim of this paper is to present some of the results obtained by TAC on the transmission of economic shocks across countries and focusing on the asian financial crises.*

Keywords: Country risk, Early Warnings, Contagion, Markov Switching, Neural Networks

1 Introduction

Many theoretical definitions of the contagion of economic and financial crises are available in the literature but problems across theories and empirical works are not yet resolved. Broadly, the theoretical works on

the international propagation of shocks in developing economies can be separated into three categories, that are defined by Masson (see (19)):

- The first one, namely the 'monsoonal effect', is based on global shocks that affect the economic fundamentals of more than one country.
- The second definition consists on 'fundamentals-based' contagion ((16)). The contagion is here defined as a country-specific shocks that affect the economic fundamentals of other countries because of their trade or financial linkages.
- The last category, so-called 'pure contagion' by Masson or 'shift contagion' by Forbes and Rigobon, gathers shocks which are not explained by fundamentals and mainly explained by investor behaviour. Relatively to this third definition, Edwards (2000) goes on to restrict the term 'economic contagion' to the situations where the magnitude of a shock that is transmitted exceeds the *ex-ante* expectations on the basis of fundamentals.

For practical purposes, the litterature is mostly focused on the last definition. Consequently, economists marginalize the interdependence between countries because it could be associated to normal transmission vectors that could not only occur during crisis periods but also during normal or stable periods. However, the goal of this paper is not to identify only the pure contagion but rather the contagion in a broad sens of the word.

2 Methodology and Data

The raw data used for this research project are taken from the IMF International Financial Statistics, the World Bank World Development Indicators and Oanda over the period 1970-2007.

Most of the analysis is done on a panel of five countries: Thailand, Philippines, Malaysia, Indonesia

and Korea.

All the country Ratings, Scores and Crisis Signals that are used are taken from the Riskmonitor country risk assessment system.

3 Statistical Analysis of Correlation

The most popular definition of the contagion in academic literature is based on correlation coefficient. It is assumed that there exists contagion as soon as a sudden increase is observed on the correlation coefficient, during a crisis period when compared to a tranquil period (see (6) for a detailed analysis). This definition has often been reconsidered, notably by Forbes and Rigobon in 1998, arguing that the correlation analysis is biased because it is based on the market volatility, which implies heteroskedasticity issue.

Although this definition was often criticable, we undertake an interesting descriptive view on correlation, selecting Asian countries at the end of 1990s.

We insist on the high instability of correlation over time, by showing graphs on rolling time cross market correlation.

The consequence is that a simple statistical analysis is not sufficient to identify precisely and to conclude on the existence of contagion.

4 Contagion Proxies and Markov Switching Models

In order to identify more precisely about the existence, the period, the duration and the probability of contagion than by using simple economic ratios on exchange rates of financial market indices (i.e. exchange rate depreciation in two countries separated by two month maximum), we use Markov Switching Models on historical correlations. As shown by Krozlig (see (17)), these non-linear models are usually relevant for the analysis and the precise identification of different regimes of activity, business cycles and structural breaks.

In our case, the objective variable is a correlation regime, that needs to be evaluated precisely to decide about the existence of contagion or not in case of economic or financial crisis. So, we define three regimes of contagion based on the evaluated regime

of correlation: low risk of contagion, medium risk and high risk of contagion. We use a MS-VAR model over the period 1970-2007 with a dependent variable that is the correlation between the monthly Thai Baht exchange rate (vs USD) and the other asian countries of the sample (Indonesia, Malaysia, Philippines, South Korea).

We find that a high contagion risk occurs during the Asian financial crises and that the model could be used as a proxy to evaluate the occurrence of contagion.

5 Contagion Patterns and Self Organizing Maps

Finally, establishing a contagion indicator on the Asian crisis is a good onset but TAC ambition is not to determine the transmission of a shock across markets after the crisis but before the crisis occurs.

Therefore, the idea in this last part is to use cross our contagion analysis with economic and financial variables by using a modern classification analysis that would allow non-linear relation between variables and missing data: the Self Organizing Maps (or Kohonen maps).

We use these neural network to evaluate the linkages between our contagion indicators and economic and financial fundamental variables that could be related to the transmission channels of contagion.

6 Conclusion

The article concludes with a summary of principal findings in TAC research on the transmission of shocks across countries and recommendations for the next step.

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