Constructing a financial fragility index for emerging countries ☆

Ahmet Sensoy *, Kevser Ozturk, Erk Hacihasanoglu

Borsa Istanbul, Research Department & Business Development Department, Istanbul 34467, Turkey

ARTICLE INFO

ABSTRACT

This article proposes a novel framework to construct a financial fragility index (FIX) of an emerging country from five main variables by combining the methods of principal component analysis and dynamic conditional correlations. The main contribution of the FIX is the time-varying weighting scheme of the variables and it is demonstrated for a leading emerging market, Turkey. A comparison with the classic principal component approach on forecasting economic activity-expectations and a policy making application are presented.

© 2014 Elsevier Inc. All rights reserved.

1. Introduction

Investors, policy makers, portfolio managers and even the ones in real sector would like to track the developments, expectations and stress regarding financial markets with as few indicators as possible, especially after the global financial crisis in 2008. To serve this aim, financial conditions or fragility indexes are designed to provide information about current or even the future state of markets, and

---

to show early warning signals of financial shocks. Therefore these indexes not only help to see the impact of relevant policy decisions on financial markets but also serve as an indicator of investor sentiment.

Even though the name sounds like "one cure fits all", unfortunately there is no consensus on design of these indexes. Besides continuously evolving market structure, high amount of capital flows between countries, introduction of new financial instruments and new role of emerging countries in world financial system complicated the understanding of the markets, thus hardened the construction of financial conditions/fragility indexes. Designing an index should cover all the related financial variables with minimum overlap, and the complexity of analysis increases even more if an emerging country is under examination; extra care needs to be paid to select reliable and available variables.

This paper shows how to construct a financial fragility index of an emerging country and demonstrates the results for Turkey. These type of indexes have long been used to evaluate the state of the financial conditions and stress (see Hakkio and Keeton (2009) and Kliesen et al. (2012) for a survey of these indexes). They are typically built using simple weighted averages or the first principal component of several financial indicators. Although this paper also adopts a principal component approach, it differs from previous studies as it allows the correlations to vary in time. Thus, the weights of the financial indicators in the principal components are adjusted dynamically and endogenously.

It is found that a dynamic weighting scheme may be more appropriate compared to static work as it captures the time-varying importance of the financial indicators. We also construct another fragility index using the same variables but by the classical principal component approach, then we discuss their performances in terms of forecasting economic activity. Finally, we present a practical application of FIX to answer an important policy question.

The rest of the paper is organized as follows: Section 2 introduces the data and describes the methodological approach used in this study. Section 3 reports the empirical results. Finally, Section 4 provides a brief discussion with the concluding remarks.

2. Data and methodology

We construct the financial fragility index using five main variables; namely, benchmark stock market index (in local currency), exchange rate against equally weighted basket consisting of US dollar and euro, i.e. (0.5 USD + 0.5 EUR)/local currency, credit default swap values quoted for 5 year sovereign bonds, interbank transaction-weighted over-night local currency borrowing/lending rate and finally, local currency benchmark government bond yields with 2 years to maturity. Each one of these variables stands for a particular fragility factor in financial markets of emerging countries:

- SM: Stock market is the main indicator of the general market mood.
- FX: Exchange rate against most heavily used and traded currencies is an indicator of the currency risk.
- CDS: Credit default swap is an indicator of the default risk on a sovereign debt.
- ST-IR: Interbank overnight rate denotes the short-term liquidity risk.
- LT-IR: Bond yield with 2 years to maturity denotes the long-term perspectives on the country's economy.[1]

Since our construction can be applied to any emerging market, we demonstrate it on a leading one; Turkey.[2] The source of data for the first three variables is Bloomberg while the latter two are obtained

---

[1] Although long-term stands for 10–30 years in financial markets, it is not even possible to find government debt instruments with 5 years to maturity until the last 2–3 years for emerging markets. Therefore, due to their high liquidity, debt instruments with 2 years to maturity are considered.

[2] The reason is that all variables except one can be found on several data servers, however short-term interest rate, i.e. interbank overnight transaction-weighted rate is hard to come by (it is possible to find interbank offered rate but this is not necessarily a realized rate). We obtained this data from the Banks Association of Turkey. Naturally, the benchmark stock market index is taken as BIST100 index.