

## 摘要

本文是應用極值理論，檢定台灣二十六個產業報酬率之極端風險值，是否因 921 地震而有所改變，我們分別觀察尾端指數與尾端分位數是否會因 921 地震而有顯著改變；換言之，本文關心 921 地震前、後，各產業指數上漲及下跌風險是否具一致性，這為「結構性改變」檢定；另一方面，我們分別探討台灣產業之左尾端分位數(下降風險值)在 921 地震前(後)是否和右尾端分位數(潛在上升風險值)有所差異，這稱為「非對稱性改變」檢定。本文也進一步探討產業與市場大盤加權指數、及兩兩產業間的共同超額機率，是否會因 921 地震而存在結構性及非對稱性改變。

研究結果發現 921 地震後，大多產業報酬率之下降風險大於潛在上升風險值，且產業指數之下降風險及潛在上升風險均有顯著增加，此結果顯示台灣大多產業極端風險值存在結構性改變，且 921 地震過後，產業極端風險值之非對稱性更為顯著。另外，我們發現兩兩產業間之共同上漲及共同下跌之機率，於 921 地震前、後均無顯著差異；然而，921 地震過後，兩兩產業間共同下跌的機率則都顯著高於共同上漲的機率。

**關鍵詞：**極值理論、921 地震、尾端風險值、非對稱性改變、結構性改變

## Abstract

This paper applies “extreme value theory” to test if tail risk values of 26 industries in Taiwan’s stock market change due to 921 Earthquake. We test if tail index and tail quantile significantly change due to 921 Earthquake, respectively. That is, our paper concerns if downside risk and upward potential risk for each sectoral index are consistent prior to and posterior 921 Earthquake. This is called “Structural Change test”. On the other side, we test if left tail quantile (downside risk) is the same with the right tail quantile (upward potential risk) before (and after) 921 Earthquake, respectively. This is called “Asymmetric change test”. Besides, this paper future tests if the co-exceedance probabilities for sectoral indices with respect to market weight index, and for pairs of sectoral indices have structural and asymmetric changes prior to and posterior 921 Earthquake.

Our empirical results indicate downside risks are significantly larger than upward risks for most industries posterior to 921 Earthquake. Both downside risks and upward potential risks significantly increase after the 921 Earthquake. These findings imply 921 Earthquake causes the tail risk values to have structural change on most sectoral indices. On the other hand, after 921 Earthquake, the asymmetries of tail risk values are more significant. Besides, we find the probabilities of simultaneous booms or simultaneous crashes for pairs of sectoral indices

before 921 Earthquake are not significantly different from those after 921 Earthquake. However, the probabilities of simultaneous crashes for pairs of sectoral indices after 921 Earthquake are significantly larger than those of simultaneous booms.

**Keywords:** Extreme Value Theory, 921 Earthquake, Tail Risk Value, Asymmetric Change, Structural Change