Diversification in Conventional and Islamic Stock Indices: Evidence from Multivariate-GARCH Analysis

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1.0 Introduction
1.1 Background of the Study

- International investors are actively looking for investment opportunities that can lower unsystematic risks.

- Investment diversification in cross-border markets as well as into different classes.

- But, how do they identify this?

- Asset correlation - The lower correlation between assets, the greater risk reduction.
1.2 Problem Statement

• Earlier studies found that diversification benefits may exist for investors and fund managers by creating a well-diversified portfolio with lowest possible risks (Grubel, 1968; Levy & Sarnat, 1970; Agmon, 1972; Lessard, 1973; Solnik, 1974; Smith et al. 1993).

• However, some studies showed that the international capital markets have been increasingly integrated with evidences of increased correlations among asset returns (Von Furstenberg and Jeon, 1990; Masih & Masih, 1999; Driessen & Laeven, 2007; Christoffersen et al., 2012, Saiti et al., 2014; Nguyen & Elisabeta, 2016).

• Given mixed previous findings, there are obvious needs to gain comprehensive understanding on asset returns movements in different markets by providing more recent empirical evidence.
1.2 Problem Statement

- The global markets have recently glimpsed an economic downturn which sparks a fear of another global financial crisis.
- Please see examples in the next slides.
- The Malaysian financial markets seem to be highly susceptible to the recent devaluation of ringgit and serious fluctuation of global commodity prices.
- The present study is motivated to assist the Malaysian-based investors in identifying possible abroad investment opportunities for diversification purposes.
High volatility for equities, bonds and currencies…

Source: Thomson Reuters Eikon
Oil price had fallen below USD28 to its lowest point over the last 13 years…

Source: CNN Money

Crude oil (barrel)

$45.39  $17.55  -27.88%

Epic oil crash
Crude down 42% in 2015 alone

Source: Thomson Reuters

Source: CNN Money
Ringgit fell below RM4 per USD for the first time since the 1997 financial crisis…

Ringgit Falls Most in Three Weeks as Oil Prices Slump Overnight

by Y-Sing Liau

October 13, 2015 — 9:04 AM HKT Updated on October 13, 2015 — 5:12 PM HKT

Ringgit falls despite foreign reserves edge higher

KUALA LUMPUR (NewsRise) -- Malaysia's foreign exchange reserves edged higher in the first two weeks of September, even as the ringgit continued to languish as Asia's worst performing currency against the U.S. dollar this year.

Foreign exchange reserves at Southeast Asia's third largest economy have been declining at a monthly average of $2.2 billion over the past few months,
KLCI gets the hit too...

Ringgit, KLCI continue to fall

China equity turmoil hits Malaysia too, KLCI below key 1,700-point

Ringgit Falls to New 1998 Low as Asia Selloff Sends KLCI Lower

China equity turmoil hits Malaysia too, KLCI below key 1,700-point
If the Malaysia-based investors were to diversify into the world’s largest stock exchange markets…

**International countries**
- UK
- US
- Canada
- German
- France
- Switzerland

**Asian Countries**
- China
- Japan
- Hong Kong
- India

**Where to invest??**
1.3 Research Objectives

1. To empirically examine the dynamic conditional volatilities and correlations of the returns of the MSCI Malaysia stock index and both the selected Asian and international conventional and Islamic stock index returns.

2. Do the Malaysia-based conventional equity investors benefit from diversifying their assets into both the selected Asian and international conventional and Islamic stock indices?
2.0 Theoretical Underpinnings & Literature Review
2.1 Market Integration

• How do we define market integration?
2.2 Related Finance Theories

- Modern Portfolio Theories (MPT)
  - Capital Asset Pricing Model (CAPM)
  - Efficient Market Hypothesis (EMH)
2.3 Critical Review of Previous Studies

- Studies on Regional Diversification Benefits
- Studies on International Diversification Benefits
Studies on Regional Diversification Benefits

- Huberman (2001) and Grinblatt and Keloharju (2001) argued that investors would prefer to invest in domestic or familiar markets compared to foreign.

- Studies on correlation between regional indices are rich in literature.

- However, evidence showing intra-regional diversification benefits for investors within similar trade region has been lacking with notable exception of Masih and Masih (1999), Driessen and Laeven (2007), and Hammoudeh et al. (2008).
## Studies on International Diversification Benefits

<table>
<thead>
<tr>
<th>Authors</th>
<th>Countries/Regions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narayan et. al (2014)</td>
<td>Emerging markets v. US, Australia, China &amp; India</td>
<td>China’s market correlation with other five emerging Asian markets is much higher compared to that of Australia and the US</td>
</tr>
<tr>
<td>Nguyen &amp; Elisabeta (2016)</td>
<td>China v. ASEAN</td>
<td>Correlation increased significantly during the crisis</td>
</tr>
<tr>
<td>Christoffersen (2012) &amp; Christoffersen et al. (2014)</td>
<td>Developed markets v. Emerging markets</td>
<td>Diversification benefits reduced; although higher in emerging markets compared to developed markets</td>
</tr>
<tr>
<td>Burdekin &amp; Siklos (2012)</td>
<td>Asia Pacific</td>
<td>Diversification benefits decreased</td>
</tr>
</tbody>
</table>
3.0 Research Methodology
3.1 Multivariate GARCH-DCC

Comparison between the Gaussian DCC model and the t-DCC model

Plotting the estimated conditional volatilities and correlations.
Why did we choose MGARCH-DCC?

High in accuracy in pinpointing changes in the correlation

Ability to detect plausible contagion effects

Ability provides a forecast of volatilities & correlations

A simple process of estimating dynamic correlation matrix

it is free from any bias against volatility
3.2 Data

- Daily time series closing price data from Thomson Reuters Datastream
- From 29/6/2007 to 30/6/2016 (8 years)

**Base Indices**
- MSCI Malaysia Index

**Asian Indices**
- Asian Conventional Indices
  - MSCI Southeast Asia Index
  - MSCI China Index
  - MSCI Japan Index
  - MSCI Hong Kong Index
  - MSCI India Index
- Asian Islamic Indices
  - MSCI Southeast Asia Islamic Index
  - MSCI China Islamic Index
  - MSCI Japan Islamic Index
  - MSCI Hong Kong Islamic Index
  - MSCI India Islamic Index

**International Indices**
- International Conventional Indices
  - MSCI United States Index
  - MSCI United Kingdom Index
  - MSCI Canada Index
  - MSCI France Index
  - MSCI Germany Index
  - MSCI Switzerland Index
- International Islamic Indices
  - MSCI United States Islamic Index
  - MSCI United Kingdom Islamic Index
  - MSCI Canada Islamic Index
  - MSCI France Islamic Index
  - MSCI Germany Islamic Index
  - MSCI Switzerland Islamic Index
4.0 Data Analysis & Discussion
### 4.1 Model Selection

<table>
<thead>
<tr>
<th>No.</th>
<th>Index Returns</th>
<th>Gaussian model</th>
<th>t-DCC model</th>
<th>The estimated d.f. for the t-normal distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MSCI Malaysia index v. Conventional MSCI Asian indices</td>
<td>46,426</td>
<td>46,829.2</td>
<td>7.6849</td>
</tr>
<tr>
<td>2</td>
<td>MSCI Malaysia index v. MSCI Asian Islamic indices</td>
<td>45,714.5</td>
<td>46,110</td>
<td>7.7757</td>
</tr>
<tr>
<td>3</td>
<td>MSCI Malaysia index v. Conventional MSCI international indices</td>
<td>57,131.1</td>
<td>57,576.9</td>
<td>7.7993</td>
</tr>
<tr>
<td>4</td>
<td>MSCI Malaysia index v. MSCI international Islamic indices</td>
<td>55,651.3</td>
<td>56,024.9</td>
<td>8.5134</td>
</tr>
</tbody>
</table>
### 4.2 Identifying Diversification Benefits for Conventional Malaysia-Based Investors

#### Unconditional Volatilities of Asian Index Returns

<table>
<thead>
<tr>
<th>No</th>
<th>MSCI Conventional Indices</th>
<th>Unconditional Volatility</th>
<th>MSCI Islamic Indices</th>
<th>Unconditional Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malaysia</td>
<td>0.010738</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Southeast Asia</td>
<td>0.012027</td>
<td>Southeast Asia</td>
<td>0.012064</td>
</tr>
<tr>
<td>3</td>
<td>Hong Kong</td>
<td>0.014307</td>
<td>Hong Kong</td>
<td>0.012955</td>
</tr>
<tr>
<td>4</td>
<td>Japan</td>
<td>0.014778</td>
<td>Japan</td>
<td>0.014941</td>
</tr>
<tr>
<td>5</td>
<td>India</td>
<td>0.018172</td>
<td>India</td>
<td>0.018022</td>
</tr>
<tr>
<td>6</td>
<td>China</td>
<td>0.018965</td>
<td>China</td>
<td>0.019835</td>
</tr>
</tbody>
</table>

#### Unconditional Volatilities of International Index Returns

<table>
<thead>
<tr>
<th>No</th>
<th>MSCI Conventional Indices</th>
<th>Unconditional Volatility</th>
<th>MSCI Islamic Indices</th>
<th>Unconditional Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Malaysia</td>
<td>0.010738</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Switzerland</td>
<td>0.013084</td>
<td>Switzerland</td>
<td>0.011837</td>
</tr>
<tr>
<td>3</td>
<td>US</td>
<td>0.013481</td>
<td>US</td>
<td>0.012674</td>
</tr>
<tr>
<td>4</td>
<td>UK</td>
<td>0.016126</td>
<td>UK</td>
<td>0.016501</td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td>0.016187</td>
<td>Germany</td>
<td>0.017686</td>
</tr>
<tr>
<td>6</td>
<td>Germany</td>
<td>0.017590</td>
<td>France</td>
<td>0.017932</td>
</tr>
<tr>
<td>7</td>
<td>France</td>
<td>0.018059</td>
<td>Canada</td>
<td>0.019034</td>
</tr>
</tbody>
</table>
4.3 Identifying Diversification Benefits for Conventional Malaysia-Based Investors

Unconditional Correlations between MSCI Malaysia Index Returns & the Asian Index Returns

<table>
<thead>
<tr>
<th>No</th>
<th>MSCI Conventional Indices</th>
<th>Unconditional Correlation</th>
<th>MSCI Islamic Indices</th>
<th>Unconditional Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Japan</td>
<td>0.37943</td>
<td>Japan</td>
<td>0.37592</td>
</tr>
<tr>
<td>2</td>
<td>India</td>
<td>0.46927</td>
<td>Hong Kong</td>
<td>0.45258</td>
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<tr>
<td>3</td>
<td>Hong Kong</td>
<td>0.53501</td>
<td>India</td>
<td>0.48977</td>
</tr>
<tr>
<td>4</td>
<td>China</td>
<td>0.55921</td>
<td>China</td>
<td>0.56643</td>
</tr>
<tr>
<td>5</td>
<td>Southeast Asia</td>
<td>0.79940</td>
<td>Southeast Asia</td>
<td>0.76973</td>
</tr>
</tbody>
</table>

Unconditional Correlations between MSCI Malaysia Index Returns & the International Index Returns

<table>
<thead>
<tr>
<th>No</th>
<th>MSCI Conventional Indices</th>
<th>Unconditional Correlation</th>
<th>MSCI Islamic Indices</th>
<th>Unconditional Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>US</td>
<td>0.15403</td>
<td>US</td>
<td>0.16387</td>
</tr>
<tr>
<td>2</td>
<td>Canada</td>
<td>0.30619</td>
<td>Canada</td>
<td>0.27954</td>
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<tr>
<td>3</td>
<td>Switzerland</td>
<td>0.35182</td>
<td>Switzerland</td>
<td>0.30989</td>
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<tr>
<td>4</td>
<td>Germany</td>
<td>0.35277</td>
<td>Germany</td>
<td>0.35148</td>
</tr>
<tr>
<td>5</td>
<td>France</td>
<td>0.36868</td>
<td>France</td>
<td>0.35357</td>
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<tr>
<td>6</td>
<td>UK</td>
<td>0.38534</td>
<td>UK</td>
<td>0.37610</td>
</tr>
</tbody>
</table>
Plotting the Conditional Volatilities of the Asian Stock Returns
Plotting the Conditional Volatilities of the International Stock Returns
Plotting the Conditional Correlations Between The MSCI Malaysia Index and the MSCI Asian Indices
Plotting the Conditional Correlations Between The MSCI Malaysia Index and the MSCI International Indices
5.0 Concluding Remarks

- This study aims to assist the Malaysia-based equity investors to identify potential portfolio diversification benefits by examining the dynamic conditional correlations between the Malaysian stock index returns and the returns of the Southeast Asian market index and the world’s largest stock market indices.

- The multivariate GARCH-dynamic conditional correlation is applied to estimate the time-varying linkages of the selected Asian and international stock index returns with the Malaysian stock index returns, covering approximately 8 years daily starting from 29 June 2007 to 30 June 2016.
• The study found that the highest increase in conditional volatilities of both conventional and Islamic MSCI stock index returns happened during the period of the 2008 global financial crisis.

• Another important finding is that the Malaysian stock index is proven to be more stable during the financial crisis compared to other Asian and cross-border markets.

• In general, the results also indicate that both Asian and international Islamic stock indices are more or less volatile than its conventional counterparts, thus conflicting with the proposition that Islamic equities offer less risky returns due to its compliance to Shariah principles such as the prohibition of usury, excessive uncertainty and gambling.
• Put differently, the study found that both the Asian and International Islamic stock indices do not provide extra diversification benefits compared to its conventional counterparts as far as the Malaysia-based equity investor is concerned.

• In term of regional portfolio diversification, the results tend to suggest that both the conventional and Islamic MSCI indices of Japan provide more diversification benefits compared to other regional markets.

• Meanwhile, in term of international portfolio diversification, the results tend to suggest that both the conventional and Islamic MSCI indices of International markets provide more diversification benefits compared to Regional markets.
• Thank you