

2019 Asia-Pacific Conference on Economics & Finance

RETURN AND ASYMMETRIC VOLATILITY TRANSMISSIONS BETWEEN MAIN STOCK MARKET AND SECOND-TIER STOCK MARKET: THE CASE OF HONG KONG



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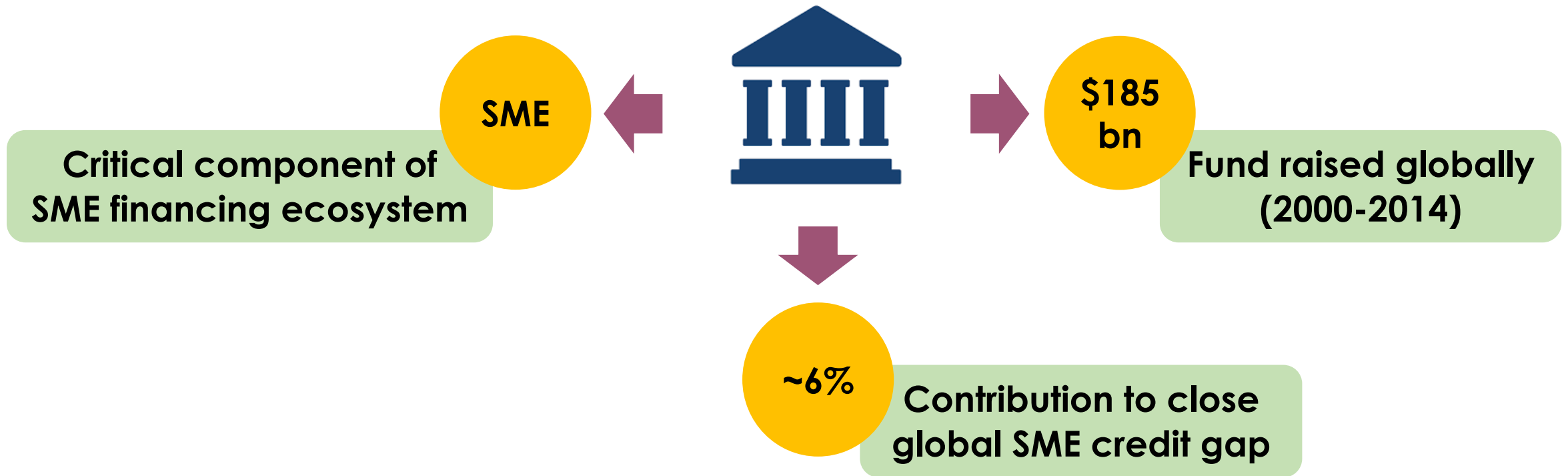
AGENDA

- 1 Second-Tier Stock Market
- 2 Growth Enterprise Market (GEM)
- 3 Identified Gaps & Questions
- 4 Data & Time Series Analysis
- 5 Key Findings & Implications
- 6 Future Research



SECOND-TIER STOCK MARKET

1.1 SECOND-TIER STOCK MARKET



SMEs funded by **equity** capital are more stable and resilient than those with debt financing during financial crises

1.2 BENEFITS OF SECOND-TIER STOCK MARKET

SMEs

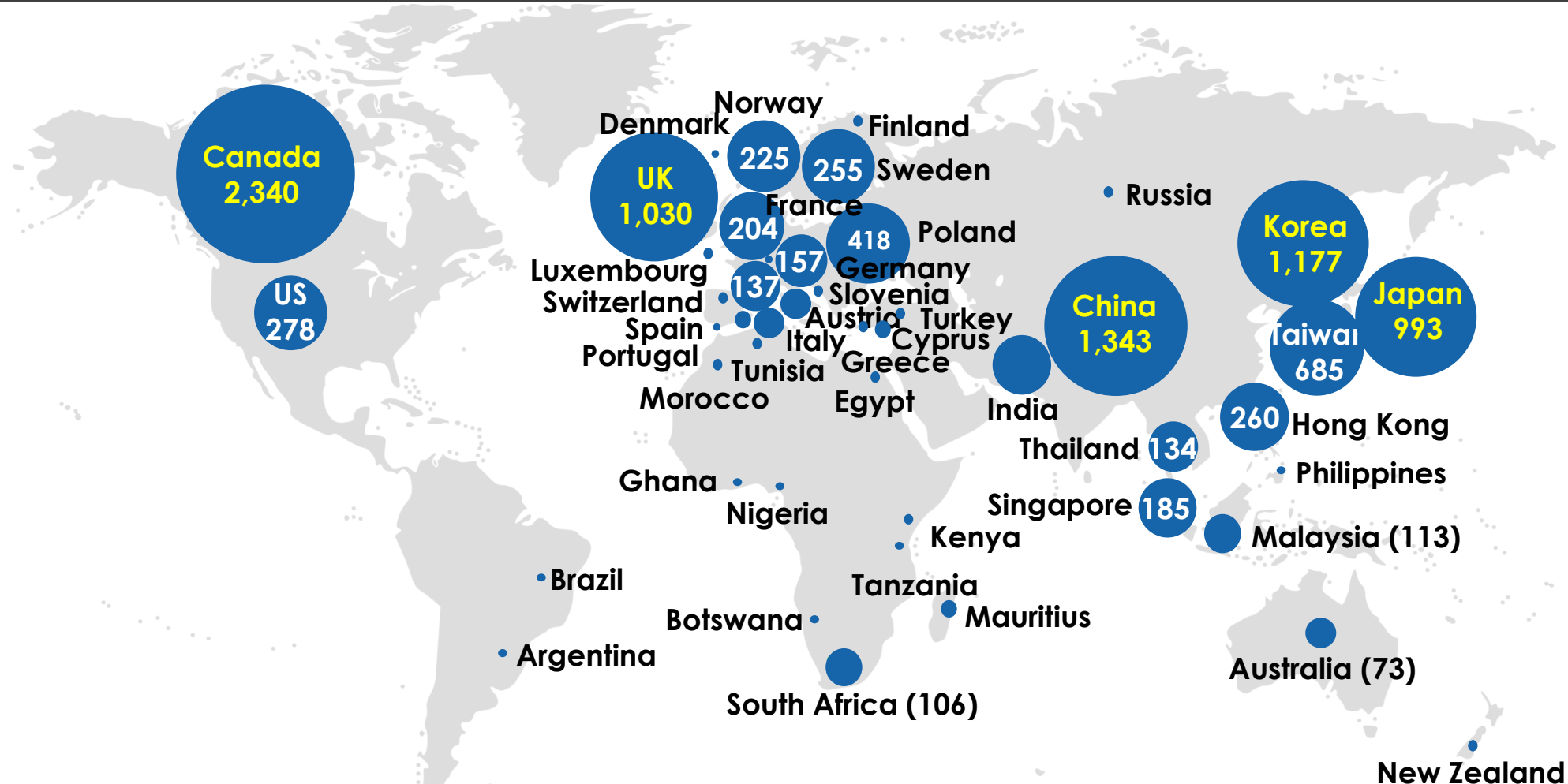
- Continuous fund raising
- Improved credit rating, market valuation
- Broader investor base
- Pathway to main exchange

Investors

- Secured trading platform
- Exit route
- Seed fund
- Diversification

1.3 SECOND-TIER STOCK MARKETS WORLDWIDE

Growing footprints ... but still **under-researched**



Note: Figures represent number of listed companies



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**GROWTH ENTERPRISE
MARKET – GEM**

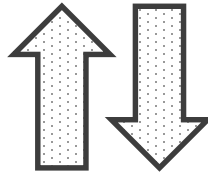
2.1 STYLISED FACTS



Hong Kong Stock
Exchange (HKEX)

- World's sixth and Asia's third largest market
- Government intervention

Pipeline
listings



Reputation
& Subsidies



Growth Enterprise
Market (1999)

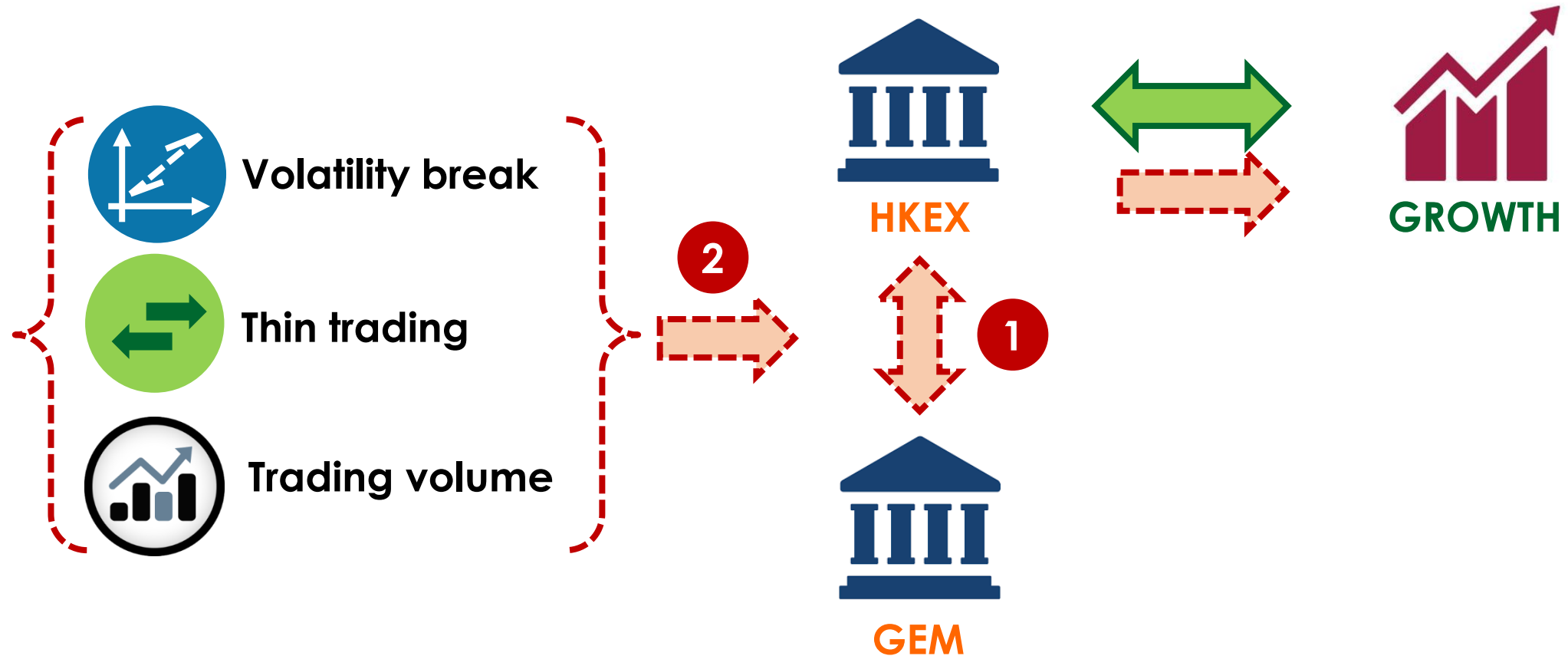
- Among the world's most successful second-tier stock markets
- Caveat emptor, let the market decide
- Small capitalization, thin trading



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IDENTIFIED GAPS & QUESTIONS

3.1 IDENTIFIED GAPS & QUESTIONS



- 1 Is there a dynamic return and volatility transmission between HKEX and GEM ?
- 2 What are the joint impacts of volatility break, thin trading, and trading volume on the dynamic transmission between HKEX and GEM ?



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DATA & TIME SERIES ANALYSIS

4.1 DATA

- **Data:** Daily closing prices and trading volumes of Hang Seng Composite Index and S&P/HKEX GEM Index
- **Variables:** Daily log returns, Daily aggregate trading volume
- **Period:** 1 Jul 2009 – 30 Dec 2016 (1,853 observations)
- **Source:** Bloomberg Database
- **Data was analysed using RATS9.2**

4.2 TIME SERIES ANALYSIS

A. Iterated Cumulative Sum of Squared (ICSS) algorithm (to detect volatility breaks)

$$(1) C_k = \sum_{t=1}^k \varepsilon_t^2$$

$$(2) D_k = \frac{C_k}{C_T} - \frac{k}{T}$$

Where: ε_t is residuals series obtained from the AR(1) process of return series (R_t)
 C_T is the cumulative sum of squared observations for the entire sample

B. State-space AR model with Kalman Filter (to adjust for thin trading)

$$(3) R_{2t} = \beta_0 + \beta_{1t}R_{2,t-1} + e_t$$

$$(4) \beta_{1t} = \beta_{1t-1} + v_t$$

$$(5) R_{2t}^d = \frac{e_t}{1 - \beta_{1t}}$$

Where: e_t and $v_t \sim N(0, \sigma_t^2)$

Note: Eq(5) follows an approach suggested by Harrison and Moore (2012) to obtain dethinned returns series

4.2 TIME SERIES ANALYSIS

C. Augmented Bivariate VAR Asymmetric BEKK-GARCH model

$$(6) \begin{pmatrix} R_{1t} \\ R_{2t}^d \end{pmatrix} = \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix} + \begin{pmatrix} \varphi_{11}^1 & \varphi_{12}^1 \\ \varphi_{21}^1 & \varphi_{22}^1 \end{pmatrix} \begin{pmatrix} R_{1,t-1} \\ R_{2,t-1}^d \end{pmatrix} + \dots + \begin{pmatrix} \varphi_{11}^p & \varphi_{12}^p \\ \varphi_{21}^p & \varphi_{22}^p \end{pmatrix} \begin{pmatrix} R_{1,t-p} \\ R_{2,t-p}^d \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} + \begin{pmatrix} \gamma_1 \\ \gamma_2 \end{pmatrix} ATV_t$$

$$(7) H_t = C'C + A'(\varepsilon_{t-1}\varepsilon'_{t-1})A + B'H_{t-1}B + D'(\kappa_{t-1}\kappa'_{t-1})D + \sum_{i=1}^n V_i'(X_iX_i')V_i + T'ATV_tT$$

Where: ATV_t denotes aggregate trading volume of the main market and the GEM at day t ;

T is a (2×2) lower triangular matrix of parameters measuring the effect of aggregate trading volume on the conditional variance of return series i ;

V_i is a (2×2) lower triangular matrix of parameters measuring the effect of volatility breaks on the conditional variance of return series i ;

X_i is a (1×2) vector of dummies for volatility breaks in return series i

Note: Standard Error of coefficients in Eq(7) are computed using first order Taylor expansion of the function around its mean



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**KEY FINDINGS &
IMPLICATIONS**

5.1 MODEL ESTIMATION

Augmented Bivariate VAR Asymmetric BEKK-GARCH model

Case 1: Raw return series

Case 2: Volatility breaks incorporated

Case 3: Volatility breaks incorporated & Thin trading adjusted

Case 4: Volatility breaks incorporated & Thin trading adjusted & aggregate trading volume integrated

5.2 KEY FINDINGS

- 1 Own market return and volatility transmission weakens or dissipates due to the joint effects of volatility break, thin trading, and trading volume
- 2 Return transmission from GEM to main market survives with diminishing magnitude and significance level while the underlying volatility transmission is eliminated

Case 4

$R_{1t} =$	0.001 (1.16)	+ 0.020 $R_{1,t-1}$ (0.92)	+ 0.006 $R_{2,t-1}$ (0.29)	- 0.027 $R_{1,t-2}$ (-1.31)	+ 0.034 $R_{2,t-2}$ (2.00)**
$R_{2t} =$	0.0002 (0.22)	+ 0.025 $R_{1,t-1}$ (1.11)	- 0.074 $R_{2,t-1}$ (-2.67)*	+ 0.007 $R_{1,t-2}$ (0.38)	+ 0.031 $R_{2,t-2}$ (1.45)
$h_{11,t} =$	4.4E-07 (0.44)	+ 0.946 $h_{11,t-1}$ (42.05)*	- 0.031 $h_{12,t-1}$ (-0.23)	+ 3E-04 $h_{22,t-1}$ (0.77)	+ 0.001 $\varepsilon_{1,t-1}^2$ (0.16)
	- 0.003 $\varepsilon_{1,t-1}\varepsilon_{2,t-1}$ (-0.06)	+ 0.002 $\varepsilon_{2,t-1}^2$ (1.55)	+ 0.074 $\kappa_{1,t-1}^2$ (2.50)**	+ 0.015 $\kappa_{1,t-1}\kappa_{2,t-1}$ (0.14)	+ 0.001 $\kappa_{2,t-1}^2$ (0.54)
$h_{22,t} =$	6E-06 (0.41)	+ 0.002 $h_{11,t-1}$ (0.31)	+ 0.081 $h_{12,t-1}$ (0.31)	+ 0.714 $h_{22,t-1}$ (5.66)*	+ 0.004 $\varepsilon_{1,t-1}^2$ (0.19)
	- 0.037 $\varepsilon_{1,t-1}\varepsilon_{2,t-1}$ (-0.30)	+ 0.084 $\varepsilon_{2,t-1}^2$ (3.18)*	+ 0.001 $\kappa_{1,t-1}^2$ (0.04)	- 0.022 $\kappa_{1,t-1}\kappa_{2,t-1}$ (-0.11)	+ 0.169 $\kappa_{2,t-1}^2$ (1.10)

5.3 IMPLICATIONS

Policymakers

- GEM can contribute indirect to economic growth in Hong Kong through its dynamic return transmission with the main market (*)
- Any policies supporting the development of GEM could potentially promote the country's economic stimulation via the main market channel

(*) The existence of causality and long-run equilibrium relationship between main market return and macro-economic indicators (real GDP growth, growth of real physical capital stock, real productivity growth, and real wage growth) in HK were confirmed.

Portfolio Managers

- Volatility transmission can be used to compute risk-minimizing hedge ratio β_t^*
- Failure to account for volatility breaks, thin trading, and trading volume may underestimate the hedging ratio for a large-cap stock portfolio

	Case 1	Case 2	Case 3	Case 4
$\beta_t^* = \frac{h_{12,t}}{h_{22,t}}$	0.005	0.023	0.027	0.113



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FUTURE RESEARCH

6.1 FUTURE RESEARCH

An investigation of liquidity spillover between the main market and the GEM could help provide further evidence for the indirect contribution of the GEM to Hong Kong's economic development via the main market channel.



Thank You for Your Attention

Questions & Comments ?



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