

To summarize, the mean equation with the day-of-the-week effect takes the form:

$$R_t = a + bR_{t-1} + dD_t + \sum_{k=1}^4 c_k WD_t^k + \varepsilon_t$$

The variance equation with the day-of-the-week effect, in the case of the EGARCH, is

$$\log(\sigma_t^2) = \omega + \sum_{j=1}^q \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^p \alpha_i (|z_{t-i}| - E(|z_{t-i}|)) + \gamma z_{t-1} + \delta D_t + \sum_{k=1}^4 \theta_k WD_t^k + \lambda TV_t$$

As mentioned earlier, we employ two specifications for each of the tax reforms. In Specification I, we restrict c_k and θ_k , to be zero ($k = 1, 2, 3, \text{ and } 4$), whereas these restrictions are relaxed in Specification II.

Specification I: $c_k = \theta_k = 0$ (without day-of-the-week effect)

Specification II: $f_k \neq 0, \theta_k \neq 0$ (with day-of-the-week effect)

In the analysis below, we select the values of p and q by AIC, changing them each from 1 to 3. The data used are the most popular aggregate price indices for each market: Shanghai Stock Exchange A share (CHASHR) for China, Korea Stock Exchange Composite (KOSPI) for Korea, India BSE (100) National (IBOMBSE) for India, Standard and Poor's/Australian Stock Exchange 200 (ASX201) for Australia, and HANG SENG PRICE INDEX (HNGKNGI) for Hong Kong. All daily closing data are taken from Thompson Reuters' DataStream. For the estimation period, we take 6 months before and after the date of the tax change. Table 2 shows the descriptive statistics of the data used in the estimation below.

Table 2: Descriptive statistics for aggregate price return in the five countries (after 1995)

country	China						Korea
date of tax change	1997/5/12	1998/6/12	2001/11/16	2005/1/24	2007/5/30	2008/4/24	1995/7/14
maximum	0.09481	0.04981	0.093998	0.079014	0.051979	0.08888	0.042278
minimum	-0.104468	-0.08798	-0.065053	-0.0396	-0.092608	-0.08045	-0.039493
mean	0.000924	0.000241	-0.001448	-0.001216	0.003534	-0.004893	-0.000433
standard dev.	0.027775	0.013275	0.016799	0.014573	0.022588	0.026515	0.011393
no. of observations	244	247	239	242	244	224	244
country	Korea	India		Australia	Hong Kong		
date of tax change	1996/3/30	2004/10/1	2006/6/1	2000/7/1	1998/4/1	2000/4/7	2001/9/1
maximum	0.027976	0.137049	0.053373	0.024598	0.172471	0.054342	0.043454
minimum	-0.036648	-0.128047	-0.071731	-0.055498	-0.147347	-0.08939	-0.092854
mean	-0.000911	0.003497	0.00071	0.000111	-0.002618	0.000878	-0.001433
standard dev.	0.011042	0.019138	0.019076	0.008917	0.032968	0.019337	0.017447
no. of observations	245	250	250	252	247	248	244

4. Estimation Results

Table 3 (at the end of this paper) exhibits the results for GARCH. It is clear that, in many cases, the coefficients for the tax dummy, D , are insignificant. This is true whether the change is a tax cut or an increase. When significant, the sign of the coefficient is in the same direction as the change in the tax rate, supporting the contrarian view. This is in line with the existing literature regarding the more advanced economy. The only notable exception is the tax increase in June 2006 in India. The coefficient for D is of the negative sign and significant at the 1% level. This suggests that the tax increase led to a reduction in volatility, in line with the conventional view.

Table 4 (at the end of this paper) exhibits the results for EGARCH. The coefficient of asymmetry, γ , is largely negative, although not uniformly significant, suggesting a leverage effect. The sign of the coefficient for D is largely in the same direction as the change in the tax rate. However, besides the tax increase in 2006 in India, different results are obtained in a few cases: (a) the tax cut in June 2000 in China (specifications I and II), (b) the tax cut in Korea (specification I) in 1994, and (c) the tax cut in 1996 in Hong Kong (specification II). However, for (b), the coefficient is insignificant in Specification II with the dummy for Monday being significant. In (c), the significance is only at the 10%

level. Only (a) may be taken as decent evidence for the conventional view. In 21 other cases out of 28, however, the obtained results are in line with the contrarian view or suggestive that STT has no effect on volatility, as found in GARCH estimations in Table 3 and existing literature based on more advanced economies.

5. Conclusion

While global financial turmoil in recent years has resulted in renewed interest in taxing financial markets, there have been two opposing views on the effect of turnover tax on return volatility. In the conventional view, the tax reduces volatility, whereas it increases volatility in the contrarian view. The existing literature either suggests that the tax has no effect or else supports the contrarian view, but it predominantly addresses advanced economies and/or is outdated. The world's 'geography' of finance has significantly changed since the days when those advanced economies levied STTs; now many countries in the Asia-Pacific region rank among "financial powers." As these countries still have STTs or have had them until recently, this paper took up episodes of STT reform in those countries, and investigated the effects of STTs using GARCH and EGARCH models. The results obtained are in line with the existing literature based on more advanced economies: the STT has no effect or possibly an effect to reduce volatility, but never to increase it.

Table3: Estimation results for GARCH

Notes: *, **, and *** indicate that the reported coefficient is significant at the 10, 5, and 1% level, respectively.

Country	China												Korea		
Date of tax change	1997/5/12		1998/6/12		2001/11/16		2005/1/24		2007/5/30		2008/4/24		1995/7/14		
Nature of tax change	Tax increase		Tax out		Tax out		Tax out		Tax increase		Tax out		Tax out		
Specification	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
mean equation	c	3.79	4.39	1.44	1.20	-0.44	-2.35	-2.085**	3.88	8.098***	12.82***	-5.259***	-3.42	-0.16	-0.51
	$\alpha(-1)$	-42.81	-69.39	112.96	65.37	-23.39	53.67	-13.33	-46.60	-85.688*	-24.08	-104.672**	-108.39	139.876***	117.10
	tax	-3.82	-7.488**	-1.82	-1.77	-0.12	0.93	0.33	-2.22	-6.82**	-7.792**	-0.70	-2.71	-0.95	0.41
	mon	-	-0.05	-	0.11	-	0.22	-	-6.918***	-	-8.133*	-	-4.01	-	-0.97
	tue	-	4.99	-	-1.68	-	5.325**	-	-6.83**	-	-0.08	-	-0.71	-	-2.19
	wed	-	5.82	-	-0.17	-	-1.76	-	-4.80	-	-2.15	-	-0.97	-	1.86
thu	-	-1.47	-	1.74	-	2.42	-	-0.59	-	-8.742*	-	-2.13	-	0.17	
variance equation	c	0.215***	0.102**	0.0773***	0.01	0.01	0.123***	0.08	0.15	1.423***	0.381***	1.234***	1.377**	0.161***	0.0759*
	tax	-0.05	-0.01	0.00	0.037*	0.01	0.00	0.05	0.02	0.692***	0.08	0.37	0.10	0.00	0.02
	mon	-	-0.03	-	0.0755**	-	-0.141***	-	-0.168*	-	0.232*	-	-0.24	-	0.12***
	tue	-	-0.237***	-	0.04	-	-0.135***	-	-0.05	-	-0.12	-	-0.593***	-	-0.07
	wed	-	-0.04	-	0.091**	-	-0.122**	-	-0.05	-	0.12	-	-0.385***	-	-0.02
	thu	-	0.05	-	0.124***	-	-0.0783*	-	-0.08	-	0.199*	-	-0.252*	-	-0.03
order	p	1	3	1	1	3	2	3	3	3	3	2	3	3	3
	q	1	2	1	2	3	2	3	1	3	3	1	3	3	1
Adj. r-squared	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
AIC	-4.47	-4.51	-5.95	-5.92	-5.59	-5.59	-5.68	-5.65	-4.78	-4.78	-4.42	-4.40	-6.18	-6.17	
no. of observation	244	244	247	247	239	239	242	242	244	244	224	224	244	244	

Country	Korea		India		Australia		Hong Kong								
Date of tax change	1996/3/30		2004/10/1		2006/6/1		2000/7/1		1998/4/1		2000/4/7		2001/9/1		
Nature of tax change	Tax out		Tax increase		Tax increase		Tax out (abolition)		Tax out		Tax out		Tax out		
Specification	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
mean equation	c	-0.62	1.57	2.525**	8.491**	0.67	3.831*	1.11	0.33	-0.47	8.38	2.10	0.59	-2.20	-2.51
	$\alpha(-1)$	174.583**	206.212***	161.364*	190.856**	187.417***	200.069***	24.78	-0.84	54.47	70.12	76.34	86.85	-53.76	18.16
	tax	-0.23	-2.997**	1.74	1.34	1.39	0.22	-1.43	-1.85*	-4.20	-4.49	-1.92	-1.41	3.31	1.38
	mon	-	-5.009***	-	-7.544*	-	-7.805***	-	1.56	-	-7.36	-	3.16	-	1.13
	tue	-	0.68	-	-9.427**	-	-2.00	-	2.284*	-	-9.09	-	0.85	-	2.24
	wed	-	1.75	-	-0.76	-	-5.823**	-	1.00	-	-19.108***	-	0.86	-	-3.40
thu	-	-3.601*	-	-6.997*	-	0.05	-	-0.23	-	-5.75	-	0.89	-	-1.72	
variance equation	c	0.00	0.08	0.0144**	0.354***	0.00714***	0.281***	0.0414**	0.0425***	0.174**	0.627***	0.00772***	0.07	0.02	0.02
	tax	0.00	0.02	0.0419**	0.03	-0.0063***	-0.199***	-0.0244*	-0.0149*	-0.02	-0.01	-0.00479***	-0.01	0.00	-0.0133**
	mon	-	0.00	-	-0.325***	-	0.11	-	0.00	-	-0.503***	-	0.00	-	-0.09
	tue	-	-0.03	-	-0.27***	-	0.05	-	-0.0405***	-	-0.703***	-	-0.165***	-	0.01
	wed	-	0.01	-	0.07	-	0.0192*	-	-0.0503***	-	-0.804***	-	0.11	-	0.168*
	thu	-	-0.04	-	-0.385***	-	0.04	-	0.00	-	0.05	-	-0.231***	-	0.02
order	p	2	3	2	1	2	1	2	2	3	2	1	2	3	1
	q	2	2	2	1	1	2	2	2	2	2	1	1	1	2
Adj. r-squared	0.02	0.02	-0.09	-0.08	0.02	0.00	-0.01	-0.02	-0.02	0.00	0.00	-0.01	-0.01	-0.01	
AIC	-6.18	-6.21	-5.39	-5.42	-5.29	-5.21	-6.75	-6.76	-4.21	-4.21	-5.08	-5.09	-5.31	-5.29	
no. of observation	245.00	245	250	250	248	248	252	252	247	247	248	248	244	244	

Table 4: Estimation results for EGARCH

Notes: *, **, and *** indicate that the reported coefficient is significant at the 10, 5, and 1% level, respectively

Country	China												Korea		
Date of tax change	1997/5/12		1998/6/12		2001/11/16		2005/1/24		2007/5/30		2008/4/24		1995/7/14		
Nature of tax change	Tax increase		Tax cut		Tax cut		Tax cut		Tax increase		Tax cut		Tax cut		
Specification	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
mean equation	c	1	4	0	1	0	-3.504***	-1	-2	8.721***	9.055***	-4.039***	-4	0	0
	$\gamma(-1)$	75.342**	-1.32499***	110.204***	52	75	138.029***	-6.5	-19.3942***	1.23949***	73.012***	-89.756***	-61	12.6322***	98.776*
	tax	1	-6.704***	-1	-1	-2.459**	-3.528***	-2	2.260*	-10.66***	-7.419***	-2	0	-1.328**	1
	mon	-	0	-	0	-	3	-	-2	-	-4.932**	-	-4	-	-2
	tue	-	4	-	-1	-	4.789*	-	-2	-	0	-	1	-	-3.184*
wed	-	5	-	-1	-	2	-	0	-	7.943***	-	-4	-	0	
thu	-	1	-	1	-	4	-	-4.133**	-	-5.291**	-	-1	-	0	
variance equation	c	-26.75385***	-21.48517***	-3.681.554***	-282.5	-342.415***	-77	-34.93	-3837.458***	-65.08.95***	-10.91028***	-172.3793***	-1386.466***	-54.5897***	-2.434
	tax	-84	-4	16	-24	81.079***	77.034***	51	40	8.01963***	88.6314***	223	210	37.644***	-9
	mon	-	-10.25199***	-	-82	-	-802	-	-7.50	-	1.547.854***	-	41	-	731.087*
	tue	-	-10.16279***	-	103	-	2.96	-	8.8	-	43.049***	-	79	-	-46.5
	wed	-	-14.41.905***	-	-15	-	-862	-	-2.03	-	98.4146***	-	25	-	-20.6
thu	-	-230	-	-2.43	-	3.35	-	-4.55	-	1.149.838***	-	139	-	2.38	
γ	-187.417***	-95	-188.751***	-199.939***	-237.229***	-1.6761***	-40	8.8	-72.5	-436.366***	178.461***	188	-170.511***	-2.264.91**	
order	p	3	1	1	2	3	3	1	2	2	3	3	3	2	1
	q	1	3	2	2	1	2	3	3	1	3	3	2	2	2
Adj. r-squared	-0.00411	-0.00852	-0.0005	-0.00517	-0.02597	-0.04938	-0.01859	-0.07664	-0.03582	-0.02281	-0.00998	-0.03229	0.003513	-0.00572	
AIC	-4.85914	-4.59269	-6.03162	-6.00705	-5.75907	-5.73718	-5.68878	-5.77088	-4.82596	-5.00244	-4.50818	-4.53858	-6.2864	-6.18468	
no. of observation	244	244	247	247	239	239	242	242	244	244	224	224	244	244	

Country	Korea		India		Australia		Hong Kong								
Date of tax change	1996/3/30		2004/10/1		2006/6/1		2000/7/1		1998/4/1		2000/4/7		2010/9/1		
Nature of tax change	Tax cut		Tax increase		Tax increase		Tax cut (abolition)		Tax cut		Tax cut		Tax cut		
Specification	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
mean equation	c	-1.157**	-0.419	5.549***	5.22**	0.584	2.375	0.282	0.401	-3.197	5.991	1.046	-2.026	-2.207***	-1.797
	$\gamma(-1)$	222.487***	14.731***	-19.853	126.034*	183.507***	199.853***	39.737	72.151	74.765	4.087	129.377***	156.116***	0.331	6.598
	tax	4.33E-01*	-80.7E-01	-0.879	0.017	1.355	2.067	-0.319	-0.0423	-4.654*	-7.231**	-2.097	-1.277	1.896	0.93
	mon	-	-3.088*	-	-3.249*	-	-7.977**	-	0.487	-	-6.528	-	4.035	-	0.389
	tue	-	1.436	-	-4.634*	-	-2.11	-	-0.444	-	-8.993**	-	1.186	-	2.227
wed	-	-0.144	-	-1.125	-	-3.598	-	-0.986	-	-1.5814***	-	-1.656	-	-3.208	
thu	-	0.485	-	-4.849***	-	0.466	-	-2.482*	-	-6.202	-	4.796	-	-0.272	
variance equation	c	-2404.617*	-277.5804	-760.4222***	-82.740.97***	-4.2178	-271.489	-753.8063***	-820.3456**	-145.59***	-180.777	-68.5156***	-1327.034***	-443.57	-238.631
	tax	46.665	1201.6	838.612***	683.769*	-32.823***	-99.966**	-82.5117**	-0.919593**	38.131*	54.346*	-14.006	-8.354	7.968	9.102
	mon	-	-625.975*	-	-1.684.259***	-	107.007	-	45.661	-	31.6864	-	1014.681**	-	-296.332
	tue	-	-99.304	-	-447.838**	-	-205.086	-	-389.301	-	-772.169***	-	2238.53	-	-206.162
	wed	-	-367.902	-	-1142.296***	-	394.661	-	-202.54	-	21.6034	-	910.338*	-	391.822
thu	-	-382.572	-	-1243.885***	-	251.139	-	-748.12	-	18.2113	-	960.308*	-	58.512	
γ	-157.292	-163.321	-34.615***	38.315	-3.3003	-76.076	-883.11***	-57.771	-249.222***	-263.991	-285.668***	-2.58.706***	-13.1276***	-131.638*	
order	p	2	3	3	3	3	3	2	2	1	1	1	1	1	1
	q	3	3	3	3	1	2	2	2	1	1	3	2	2	2
Adj. r-squared	0.013381	0.01831	-0.01138	-0.04929	0.018446	0.011089	-0.00912	-0.01772	-0.03136	-0.00684	0.000451	0.005139	-0.00864	-0.00828	
AIC	-6.23324	-6.21873*	-5.65691	-5.64203	-5.27069	-5.24253	-6.85001	-6.83112	-4.34882	-4.37616	-5.1445	-5.11663	-5.34119	-5.3298	
no. of observation	245	245	250	250	248	248	252	252	247	247	248	248	244	244	

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Endnotes

- [1] Such leaders include, for example, Angela Merkel, Nicolas Sarközy and Gordon Brown.
- [2] *Global Financial Stability Report: Meeting New Challenges to Stability and Building a Safer System*.
- [3] For instance, many economists from all over the United States co-signed "An Open Letter from Economists in Support of Financial Transaction Taxes", in December 2009, which was made public through the Center for Economic Policy Research.
- [4] The terms "conventional view" and "contrarian view" are borrowed from Song and Zhang (2006).
- [5] Baltagi et al. (2006) examined the stock transaction reform in 1997 in China. They used a GARCH-type model but only to examine the market efficiency aspect of the tax; for return volatility, however, they use a method based on the concept of historical volatility to conclude that the increase in the tax rate led to greater volatility.
- [6] See, for example, Japan Securities Research Institute (2010) for greater details about each country's market.