NOTE: FORMATTING & STYLE LOOKS LIKE ACADEMIC PAPER!

Like Father, Like Son?

– North Korean Military Provocations and their Credibility

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VERY CLEAR ABSTRACT
- MOTIVATION
- WHAT YOU DO
- RESULTS

Abstract: North Korean military activities and provocations have increased in recent years and previous studies have showed that these provocations are not seen as credible by the financial markets. This paper uses an event study methodology to examine whether the military provocations are taken more seriously after the change in leadership in North Korea. After estimating the marginal abnormal returns on the South Korean stock market and the change in USD/WON for the past ten military events, I can conclude that Kim Jong-un (despite the increase in military activity) is not believed as more credible than his father was.

"IS GENRE"

1. Introduction

Tension between North and South Korea continues to be a hot topic and the North's ambition to develop its own nuclear and intercontinental missile system seems to have reached new heights. In early 2013 North Korea executed its third successful nuclear test and in early March, the new leader Kim Jong-un, vowed to cancel the 60 year old cease fire agreement between the two states if sanctions were not lifted.

GETS TO THE POINT!!

This paper addresses the following issues; do the financial markets take the increasing number of North Korean provocations seriously? If so, is Kim Jong-un more credible than his father Kim Jong-il was? The paper builds on Kim & Roland (2011) and Kollioas & Papadamou (2012). These two papers introduced an event study framework for analyzing the credibility of North Korean provocations by looking at the change in the stock market and exchange rate. The interesting finding they make is that the financial markets seem not to take the provocations from North Korea seriously. Kim & Roland (2011) examined 20 events between early 2000 and 2008 and only found a hand full event windows to be significant. The findings seem to be in line with North Koreas increasingly weaker economy and dependency on foreign aid and hence the ability to sustain a longer military conflict is limited.

Previous literature is limited to the period in which Kim Jong-il was in power and to my knowledge no one have studied the military provocations that have occurred during which Kim Jong-un have been in power. Furthermore, North Korean military activity have recently increased dramatically during the last years, compared to the timeframe that Kim & Roland (2011) used. This increase has been in more sophisticated military tests such as nuclear and long

ONLY A FEW KEY REFERENCES

range missile capabilities. Consequently, the change of leader and the increase in military activities gives an interesting motivation for conducting this kind of event study.

The rest of the paper proceeds as follows. Section two presents the event study methodology together with data and events. Section three shows the estimation results and gives a brief discussion together with some robustness checks and further development of the models. Finally, section four concludes.

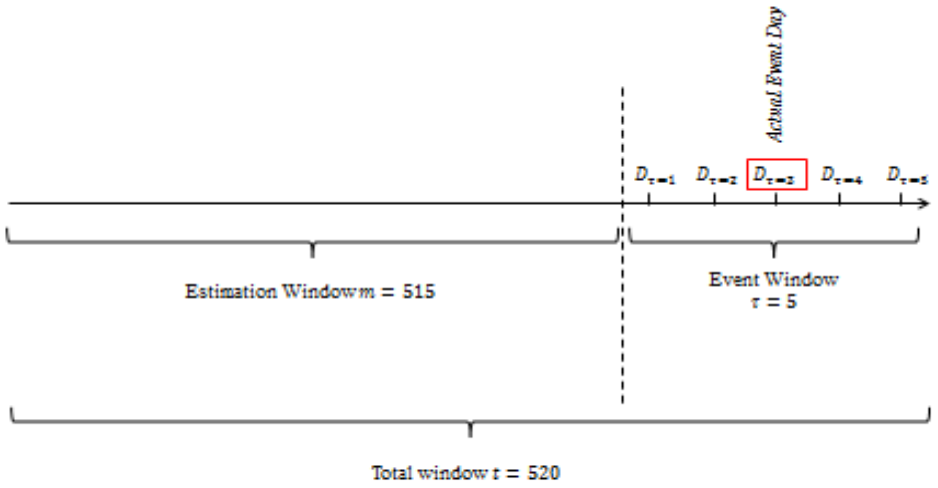
2. Data and Methodology

In order to examine whether North Korean provocations have had an impact on the financial markets a 'regression method' event study have been used (Arindrajit et al 2008). This is a variety of the standard events study methodology (e.g. Fama et al 1969). In the standard approach the return in the dependent asset is estimated by controlling for overall market return over an estimation window. Predicted returns are then estimated for each day in the event window and using actual data, absolute abnormal returns for each of the event window days are obtained. As mentioned, I will use a regression based approach for estimating marginal abnormal returns.[1] This means that each day in the event window is represented by a dummy variable which takes on the value of one for that particular event or zero otherwise. By examining significance levels in the coefficients (marginal abnormal returns) I can then determine whether any abnormal movements in the stock market and foreign exchange market took place for that specific day.

[1] According to Pynnonen (2005) this yields the exact same results as the standard approach.

OVERALL, GOOD CLEAR METHODOLOGY SUMMARY COVERING KEY TECHNICAL POINTS

The first model (equation 1) estimates the daily return in the South Korean stock exchange index (ret_kospi), controlling for the return in Dow Jones (ret_dowj) and Nikkei (ret_nikkei). This is done in order to extract the effects of aggregate news or worldwide variation in the stock market. I assume that North Korean military events affect the South Korean financial markets more than the foreign markets. The event window is set to five days ($5 = \tau$). The two days before the event ($D_{\tau=1}$ and $D_{\tau=2}$) are meant to pick up any pre-event information leakage and the two dummies after the event day ($D_{\tau=4}$ and $D_{\tau=5}$) are measuring shock persistence. $D_{t=3}$ is the day in the middle of the event window, i.e. the actual day that the event took place on. Existing event study literature suggests picking a sufficiently large estimation window, (DellaVigna & LaFerrara, 2010), hence I choose an estimation window of two years - in total 515 ($m = 515$) trading days. I then run the following regression over the combined estimation and event windows ($m + \tau = 520 = t$).



OUTLINE SIMPLE ESTIMATING EQUATIONS

$$ret\_kospi_t = \alpha + \beta_1 ret\_dowj_t + \beta_2 ret\_nikkei_t + \sum_{\tau=1}^{5} D_\tau \gamma_\tau + \varepsilon_t \qquad (1)$$

A similar framework is used to capture the change in the exchange rate (equation 2). I estimate the change in USD/WON ($\Delta USDWON$), controlling for the change in EUR/WON ($\Delta EURWON$) and YEN/WON ($\Delta YENWON$). A negative shock, e.g. a North Korean military provocation, should trigger an upward pressure on the USD/WON rate as the WON weakens due to a flight to the safer currency USD. Hence we would expect to see a positive relationship between the event dummies and the change in USD/WON if the events lead to abnormal returns. In terms of the event window and estimation window the methodology is the same as before.

$$\Delta USDWON_t = \alpha + \beta_1 \Delta EURWON_t + \beta_2 \Delta YENWON_t + \sum_{\tau=1}^{5} D_\tau \gamma_\tau + \varepsilon_t \qquad (2)$$

Similarly to Kim & Roland (2011), the events for this paper were collected based on news announcement from the South Korean Ministry of Unification and documentation from BBC. Compared to Kim & Roland (2011) I am focusing solely on military events, I do so because of the recent increase in military activity and also because the previous papers found that these are the events that tends to show more significance. In total 10 military events have been identified since 2009 with the two nuclear tests (in 2009 and 2013) being the largest and most notable. Table 1 shows a detailed overview of the events used.[2]

TABLE 1 HERE

Event number six, the death of Kim Jong-il, is not a direct military event but because of its importance for the future direction of the North Korean foreign policy I have included it in this paper. Furthermore, one of the purposes of this paper is to examine if the perception of North Korean provocations have changed by the change of leader, and hence this event plays an

[2] All financial data was extracted from Datastream

important role. I assume no other major event that would have affected the financial markets occurred on the same event day. Having cross checked major news sources I can conclude that such external events did not occur during the event windows. Finally, I follow DellaVigna & LaFerrara (2010) and change the event day to the next trading day if the stock market was close on the actual event day.

3. Estimation Results and Robustness Checks

The results from the baseline OLS models are shown in table two and three. In total 20 regressions where performed and any abnormal returns for the event window dummies are examining by looking at the significance level of each dummy coefficient. In general North Koran military provocations seem to have little to no effect on the South Korean stock exchange and the USD/WON exchange rate. However, some event show some significance, at least at the 0.05 level, and overall the abnormal returns in the stock market seem to be slightly more significant than the ones for the foreign exchange market.

TABLE 2 & 3 HERE

The rocket launch in April 2009 generated the most evident post-event abnormal returns where the event dummies for the event day and the two days after, are all highly significant. This event was widely regarded as an intercontinental missile test rather than a satellite launch and these results could indicate that market feared that North Korea had the capability to launch a long distance missile.[3] Furthermore, the rocket launch in late 2012, the nuclear test in early 2013 and the bombardment of Yeonpyeong also generated some abnormal return (at least to the 0.05

FORMATS & HIGHLIGHTS
KEY INTERESTING RESULT

[3] For further reading see for example http://www.bbc.co.uk/news/world-asia-20697922

level). Furthermore, none of the pre-event dummies were significant, indicating that the markets were not aware of these events.[4]

Turing to table three and examining the abnormal changes in the USD/WON exchange rate in more detail some results are worth mentioning. First, the control variable YEN/WON is not significant and does not seem to impact the USD/WON rate in the way suggested by Kim & Roland (2011). Secondly, the earlier events (like the rocket launch and nuclear test in 2009) seem to have had the same significant impact on the exchange rate as they had on the stock market. What is interesting though is that the later events that showed some significance (although fairly weak) for the stock market, now seem not to be insignificant. In summary, the military provocations seem to play a less important role for the movements in the USD/WON than for the stock market.

ALL THE BORING TESTS ARE IN A SUB-SECTION. DO NOT DISTRACT FROM MAIN RESULT

Robustness Checks

To check the robustness of the estimates some diagnostic tests have been performed. First, the presence of a unit root may cause the regressions to be spurious. Therefore I use the augmented Dickey-Fuller test to check for stationarity. Secondly, a Portmanteau test for white noise and a Durbin-Watson alternative test for autocorrelation have been used. Lastly, I use two methods of testing for heteroskedasticity, graphically plotting the residuals and with the Breusch-Pagan test for heteroskedasticity.

TABLE 4 HERE

The results seem to be fairly consistent for both models. First of all, we can reject the null of a unit root and conclude that non-stationarity is not an issue since no underlying trend in the

[4] The satellite launch in December 2012 showed a slight significance for the stock market model but it is too low and not consistent to draw any conclusions form it.

stock market return and change in exchange rate was found. The white noise test for the residuals reveals that we do not reject the null hypothesis of white noise in the residuals, in other words the error terms have an expected mean of zero. Furthermore, the alternative Durbin-Watson test for autocorrelation shows that we cannot reject the null hypothesis of no autocorrelation either.

Despite the lack of autocorrelation, (judging from the test above), Schwert (1990a 1990b) pointed out, there could exist a tendency for movements in aggregate stock return to persist over time and hence serial correlation could still be present. This means that we should take into account any dynamic relationships between the markets, by capturing time lags between the US and Asian stock markets. I use the same framework as Kollioas & Papadamou (2012) and control for lagged effects in the control variables by modifying the stock market model (equation 3). Here the three additional control variables are the KOSPI ($lret\_kospi_t$) , Dow Jones ($lret\_dowj_t$) and Nikkei (lret_nikkei_t) indices lagged once.

$$ret\_kospi_t = \alpha + \beta_1 ret\_dowj_t + \beta_2 ret\_nikkei_t + \beta_3 lret\_kospi_t + \beta_4 lret\_dowj_t + \beta_5 lret\_nikkei_t + \sum_{\tau=1}^{5} D_\tau \gamma_\tau + \varepsilon_t \qquad (3)$$

Similarly the exchange rate model is modified by adding a lead (1) ($leadret\_dowj_t$) and a lag (1) ($lret\_dowj$) for the return in the Dow Jones (ret_dowj_t) index. According to DeJong & Kloek (1992) this has the benefits of capturing any spill-over effects from the stock market to the foreign exchange market.

$$\Delta USDWON_t = \alpha + \beta_1 \Delta EURWON_t + \beta_2 \Delta YENWON_t + \beta_3 ret\_dowj_t + \beta_4 lret\_dowj_t + \beta_5 leadret\_dowj_t + \sum_{\tau=1}^{5} D_\tau \gamma_\tau + \varepsilon_t \qquad (4)$$

TABLE 5 & 6 HERE

THIS IS OFTEN THE CASE !!

The modified models do not generate much different results than the baseline models. The lagged effects in the control variables are more significant in the exchange rate model and the lagged effects only become significant for the later events in the modified stock market model. The modified models do show some slightly stronger significance levels in the pre-event dummies. E.g. the last two rocket launches resulted in some abnormal returns in the stock market one day before the event. Furthermore, the days preceding the event day for the last five events showed some abnormal depreciation in the WON but to conclude that this was due to the fact that investors knew about the events would require further estimations.

A further examination of table four reveals that the estimations do not have a constant variance in the error terms – i.e. the presence of heteroskedasticity might cause a problem.[5] This might not lead to unbiased coefficients but to unbiased standard errors and hence the chances of making a type 2 error[6] are present. Since the examined time period is characterized by high volatility in the financial markets the presence of heteroskedasticity is not surprising. It is possible to visually determine whether the events lie within a cluster where the volatility in the error terms is high. I do so by plotting the squared residuals against time and including the events (graphs 1-4). If the events occurred on a day with extreme high volatility we should worry about the effects of heteroskedasticity altering the results. Overall, it is clear that none of the events lie on one of these clusters. This becomes even clearer when looking at the exchange rate model where the events are clearly not clustered around a spike in the variance. Therefore we can conclude that heteroskedasticity should not be a major issue in this study.

GRAPHS 1-4 HERE

[5] Because the sample is fairly large (520 observations) the use of robust standard errors is justified for.
[6] For example an event dummy might be significant but we fail to reject the null and consequently failed to recognize that that event was taken seriously by the markets.

CLEAR SUMMARY

4. Concluding Discussion

This paper set out to examine whether North Korean provocations continues to be taken lightly by the financial markets and whether the change in power as led to any changes in the credibility of the provocations. I used an event study methodology to determine whether abnormal returns for the event windows were significant or not. In total, four different market return models were used; one measuring the stock market returns and one for the change in the USD/WON exchange rate, the models were then modified by taking into account spillover effects from the stock market to the foreign exchange rate market and lagged effects.

In total 10 military events were used and the results were fairly consistent across all the models – the North Korean provocations had little to no affect on the financial markets. Even though the North Korean nuclear tests and the tests of missile systems turned out to be significant it is a bit inconsistent and weak to draw the conclusion that the markets fear North Korea. These results are in line with the previous studies that concluded that the provocations are not seen as credible. This should not come as any surprise since the North Korean economy is still heavily dependent on aid and the markets know that country could not sustain a full scale war. Furthermore there are no incentives for Kim Jong-un to use any weapons of mass destruction because that would surely be an act of suicide since the retaliation from west could mean total annihilation.

One suggestion for further study is to examine firm specific stock price data. By examining, for example Chinese, Russian and South Korean, companies that are evolved in North Korea we could perhaps obtain more consistent and significant results. Furthermore, one could model the market volatility using for example different GARCH models. Nevertheless, given the results

outlined above, the obvious policy implications that this paper suggests is that the saying; ‘like father, like son’, is indeed true, and hence policy makers should not fear Kim Jong-un anyway more than they feared his father.

APPENDIX

TABLE 1: MILITARY EVENTS

Number	Date, t	Name	Description
1	Monday, April 06, 2009	Rocket Launch	North Korea launches a rocket which they claim to have put a satellite into orbit. It is widely believed that this launch was cover operation for testing long range missiles.
2	Monday, May 25, 2009	Nuclear test 1	North Korea conducts its first successful underground nuclear test. In contrast to the nuclear test in 2006 the test is not pre-announced.
3	Monday, July 06, 2009	Missile test	North Korea violates UN resolutions by firing two rounds of test missiles into the Sea of Japan.
4	Monday, March 29, 2010	Sinking of Cheonan	The South Korean military ship *Cheonan* is torpedoed by North Korean submarine killing 46 seamen.
5	Tuesday, November 23, 2010	Bombardment of Yeonpyeon	North Korean forces engage in a artillery attack against the South Korean forces stationed at the island of Yeonpyeong.
6	Tuesday, April 12, 2011	Cyber Attack	North Korea conducts a cyber attack against the sSouth Korean financial sector.
7	Monday, December 19, 2011	Death of Kim Jong-il	The death of Kim Jong-il on the 17th is announced on the 19th of December and his son Kim Jong-un is announced as the next leader the following day.
8	Thursday, April 12, 2012	Rocket Launch 2	North Korea launched a rocket with a satellite in celebration of its new leader Kim Jong-un. The exercise is a failure.
9	Wednesday, December 12, 2012	Satellite into Orbit	A North Korean rocket launch puts a satellite into orbit, after the failure to do so in April. The UN including China regards this as a violation of a ban on North Korean ballistic missile tests, as the rocket technology is the same.
10	Tuesday, February 12, 2013	Nuclear test 2	North Korea successfully conducts its second underground nuclear test.

Sources: BBC, Korean Institute for Unification

Events that took place when the stock market was closed have been assigned the next open trading day as $D_{t=3}$

TABLE 2: SOUTH KOREAN STOCK MARKET REACTION (1)

	Events									
	Rocket Launch	Nuclear test 1	Missile test	Sinking of Cheonan	Bomb. of Yeonpyeon	Cyber Attack	Death of Kim-Jong Il	Rocket Launch 2	Satellite into Orbit	Nuclear test 2
ret_dowj	0.155***	0.156***	0.153***	0.180***	0.165**	0.149***	0.131**	0.134**	0.152**	0.165**
	(0.0391)	(0.0376)	(0.0372)	(0.0397)	(0.0543)	(0.0378)	(0.0444)	(0.0455)	(0.0538)	(0.0543)
ret_nikkei	0.630***	0.629***	0.625***	0.593***	0.574***	0.423***	0.566***	0.555***	0.635***	0.574***
	(0.0519)	(0.0501)		(0.0530)	(0.0728)	(0.0400)	(0.0621)	(0.0629)	(0.0840)	(0.0728)
D τ=1	0.000894	-0.000380	0.00264	0.00341	0.000366	0.000318	-0.00557	-0.00643	-0.00472	0.000366
	(0.00274)	(0.00152)	(0.00249)	(0.00196)	(0.00497)	(0.00246)	(0.00403)	(0.00342)	(0.00274)	(0.00497)
D τ=2	0.00132	-0.00459	0.000247	-0.000799	0.00355*	-0.00161	0.00170	0.00405	0.00443**	0.00355*
	(0.000776)	(0.00429)	(0.00477)	(0.00372)	(0.00155)	(0.00347)	(0.00312)	(0.00220)	(0.00159)	(0.00155)
D τ=3	0.00416***	-0.00336	0.00249	0.00108	-0.0103*	-0.00275	-0.0120*	-0.0141**	-0.00929	-0.0103*
	(0.00103)	(0.00549)	(0.00588)	(0.00455)	(0.00413)	(0.00397)	(0.00581)	(0.00506)	(0.00496)	(0.00413)
D τ=4	0.00672***	-0.00831	-0.00239	-0.00198	0.00893**	-0.00140	0.00355	0.00583**	0.00499**	0.00893**
	(0.00107)	(0.0108)	(0.00857)	(0.00674)	(0.00322)	(0.00693)	(0.00287)	(0.00202)	(0.00177)	(0.00322)
D τ=5	-0.0145***	-0.0138***	-0.00507	-0.00475	0.00532	-0.000124	0.00834	0.00976	0.00675	0.00532
	(0.00162)	(0.000878)	(0.00709)	(0.00523)	(0.00409)	(0.00384)	(0.00605)	(0.00519)	(0.00455)	(0.00409)
ε	0.000694	0.000659	0.000426	0.000234	-0.000130	0.000753*	0.000437	0.000442	0.0000241	-0.000130
	(0.000649)	(0.000662)	(0.000666)	(0.000616)	(0.000479)	(0.000370)	(0.000454)	(0.000458)	(0.000466)	(0.000479)
N	520	520	520	520	520	520	520	520	520	520
R-sq	0.525	0.524	0.524	0.522	0.365	0.382	0.396	0.382	0.396	0.365

Robust standard errors in parentheses

"* p<0.05 ** p<0.01 *** p<0.001"

TABLE 3: CHANGE IN THE USD/WON EXCHANGE RATE (2)

	Events									
	Rocket Launch	Nuclear test 1	Missile test	Sinking of Cheonan	Bomb. of Yeonpyeon	Cyber Attack	Death of Kim-Jong Il	Rocket Launch 2	Satellite into Orbit	Nuclear test 2
Δ*EURWON*	0.805***	0.806***	0.799***	0.807***	0.638***	0.563***	0.501***	0.482***	0.349***	0.367***
	(0.0520)	(0.0495)	(0.0491)	(0.0481)	(0.0481)	(0.0424)	(0.0395)	(0.0394)	(0.0396)	(0.0391)
Δ*YENWON*	0.0533	0.0555	0.0528	0.0466	-0.0100	0.0278	0.00557	0.00293	-0.0440	-0.0382
	(0.0365)	(0.0348)	(0.0340)	(0.0338)	(0.0347)	(0.0280)	(0.0331)	(0.0332)	(0.0284)	(0.0274)
D τ=1	-0.0185***	-0.00950	-0.00398	-0.00271	-0.00211	0.0000477	-0.00149	-0.00208	-0.00113	-0.0000836
	(0.00107)	(0.00633)	(0.00629)	(0.00487)	(0.00449)	(0.00254)	(0.00258)	(0.00227)	(0.00170)	(0.00174)
D τ=2	0.00352**	-0.00485	-0.00321	-0.00370	-0.00221	-0.00326	-0.00263*	-0.00181	-0.00192*	-0.00161*
	(0.00120)	(0.00612)	(0.00426)	(0.00320)	(0.00204)	(0.00189)	(0.00104)	(0.000941)	(0.000835)	(0.000775)
D τ=3	-0.00255	-0.00138	0.000510	-0.00112	-0.00262	0.000596	0.00210	0.00318	0.00295	0.00113
	(0.00158)	(0.00113)	(0.00187)	(0.00188)	(0.00201)	(0.00159)	(0.00297)	(0.00239)	(0.00241)	(0.00239)
D τ=4	0.0110***	0.00707*	0.00336	0.00278	0.00304	0.000517	-0.00424*	-0.00385	-0.00379*	-0.00324*
	(0.000687)	(0.00292)	(0.00362)	(0.00272)	(0.00203)	(0.00169)	(0.00210)	(0.00237)	(0.00160)	(0.00140)
D τ=5	0.00667***	0.00545***	0.00565***	0.00252	0.00408	0.00200	-0.00222	-0.000345	-0.000877	-0.000589
	(0.00112)	(0.00111)	(0.000793)	(0.00261)	(0.00229)	(0.00177)	(0.00131)	(0.00169)	(0.00168)	(0.00133)
ε	0.000121	0.0000223	0.0000509	0.000286	-0.000239	-0.000262	0.000116	0.0000808	-0.0000493	0.0000121
	(0.000329)	(0.000339)	(0.000347)	(0.000357)	(0.000324)	(0.000253)	(0.000265)	(0.000259)	(0.000208)	(0.000206)
N	520	520	520	520	520	520	520	520	520	520
R-sq	0.705	0.703	0.696	0.688	0.468	0.413	0.350	0.341	0.241	0.264

Robust standard errors in parentheses
="* p<0.05 ** p<0.01 *** p<0.001"

NO NOTES —

BAD !!!

TABLE 4: DIAGNOSTIC TESTS

	Model	
	Stock Market Return (1)	Change in FX (2)
Unit Root (Dickey-Fuller)	-33.757	-36.264
	(0.0000)	(0.0000)
Autocorrelation (Durbin –Watson, alternative)	1.737	0.565
	(0.1875)	(0.4521)
Heteroskedasticity (Breusch-Pagan)	7.57	17.14
	(0.0059)	(0.0000)
White noise (Portmanteau)	50.8660	38.7727
	(0.1165)	(0.5254)

Dickey-Fuller: Test statistics and p-value for z(t) in parentheses. Test is run for the dependent values change in KOSPI and USD/WON.
Alternative Durbin-Watson: H0:no autocorrelation, chi2 and Prob > chi2 (in parentheses)
Breush-Pagan: Q values are given with Prob > chi2 (in parentheses), H0: homoskedasticity.
Portmanteau: Q-values are given with Prob > chi2 (in parentheses), H0: white noise (no serial correlation).
The tests are for regression estimations for the models over the entire period, i.e. t=1581. Similarly to Kim & Roland (2011).

TABLE 5: SOUTH KOREAN STOCK MARKET REACTION (2)

	Events									
	Rocket Launch	Nuclear test 1	Missile test	Sinking of Cheonan	Bomb. of Yeonpyeon	Cyber Attack	Death of Kim-Jong Il	Rocket Launch 2	Satellite into Orbit	Nuclear test 2
ret_dowj	0.143***	0.147***	0.142***	0.164***	0.165***	0.159***	0.165***	0.176***	0.200***	0.213***
	(0.0427)	(0.0405)	(0.0397)	(0.0414)	(0.0386)	(0.0382)	(0.0444)	(0.0460)	(0.0551)	(0.0549)
ret_nikkei	0.662***	0.654***	0.657***	0.643***	0.535***	0.385***	0.450***	0.428***	0.479***	0.423***
	(0.0623)	(0.0609)	(0.0600)	(0.0656)	(0.0477)	(0.0495)	(0.0700)	(0.0688)	(0.0842)	(0.0711)
lret_kospi	-0.0555	-0.0551	-0.0573	-0.0508	-0.0709	-0.0577	-0.0235	-0.0307	-0.0227	-0.0376
	(0.0727)	(0.0709)	(0.0709)	(0.0808)	(0.0621)	(0.0496)	(0.0588)	(0.0584)	(0.0583)	(0.0561)
lret_dowj	-0.0501	-0.0388	-0.0495	-0.0836	0.0299	0.0968	0.241**	0.262***	0.354***	0.377***
	(0.0696)	(0.0669)	(0.0649)	(0.0689)	(0.0403)	(0.0493)	(0.0759)	(0.0773)	(0.0910)	(0.0857)
lret_nikkei	0.0221	0.0200	0.0193	0.0205	0.0458	0.0168	0.0121	0.00237	-0.0238	-0.0120
	(0.0666)	(0.0643)	(0.0632)	(0.0651)	(0.0547)	(0.0353)	(0.0512)	(0.0492)	(0.0634)	(0.0528)
D τ=1	0.00131	-0.000174	0.00322	0.00356	0.00355*	0.000952	-0.00359	-0.00398	-0.00267	0.00153
	(0.00367)	(0.00203)	(0.00290)	(0.00235)	(0.00166)	(0.00236)	(0.00438)	(0.00413)	(0.00304)	(0.00436)
D τ=2	0.00422	-0.00386	0.000453	-0.000971	-0.00160	-0.000154	0.00221	0.00471**	0.00484***	0.00371*
	(0.00423)	(0.00575)	(0.00513)	(0.00412)	(0.00307)	(0.00375)	(0.00206)	(0.00155)	(0.00142)	(0.00152)
D τ=3	0.00423***	-0.00381	0.00249	0.00112	-0.00108	-0.00290	-0.0130*	-0.0155**	-0.0108*	-0.0109*
	(0.00101)	(0.00590)	(0.00638)	(0.00496)	(0.00392)	(0.00401)	(0.00605)	(0.00520)	(0.00537)	(0.00435)
D τ=4	0.00632***	-0.00842	-0.00222	-0.00194	-0.00237	-0.00157	0.00483	0.00643*	0.00650**	0.00958**
	(0.00135)	(0.0108)	(0.00864)	(0.00672)	(0.00553)	(0.00714)	(0.00356)	(0.00263)	(0.00218)	(0.00290)
D τ=5	-0.0147***	-0.0141***	-0.00526	-0.00486	-0.00553	-0.000289	0.00671	0.00818*	0.00565*	0.00472
	(0.00174)	(0.00110)	(0.00714)	(0.00518)	(0.00436)	(0.00469)	(0.00489)	(0.00377)	(0.00284)	(0.00253)
ε	0.000698	0.000659	0.000409	0.000236	0.00101*	0.000709	0.000305	0.000318	-0.0000888	-0.000238
	(0.000665)	(0.000676)	(0.000673)	(0.000615)	(0.000462)	(0.000375)	(0.000452)	(0.000455)	(0.000445)	(0.000455)
N	520	520	520	520	520	520	520	520	520	520
R-sq	0.529	0.527	0.528	0.529	0.480	0.389	0.430	0.421	0.453	0.434

Robust standard errors in parentheses
="* p<0.05 ** p<0.01 *** p<0.001"

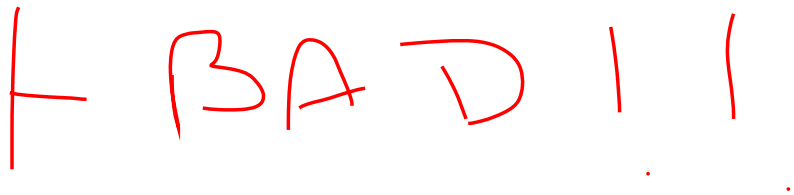
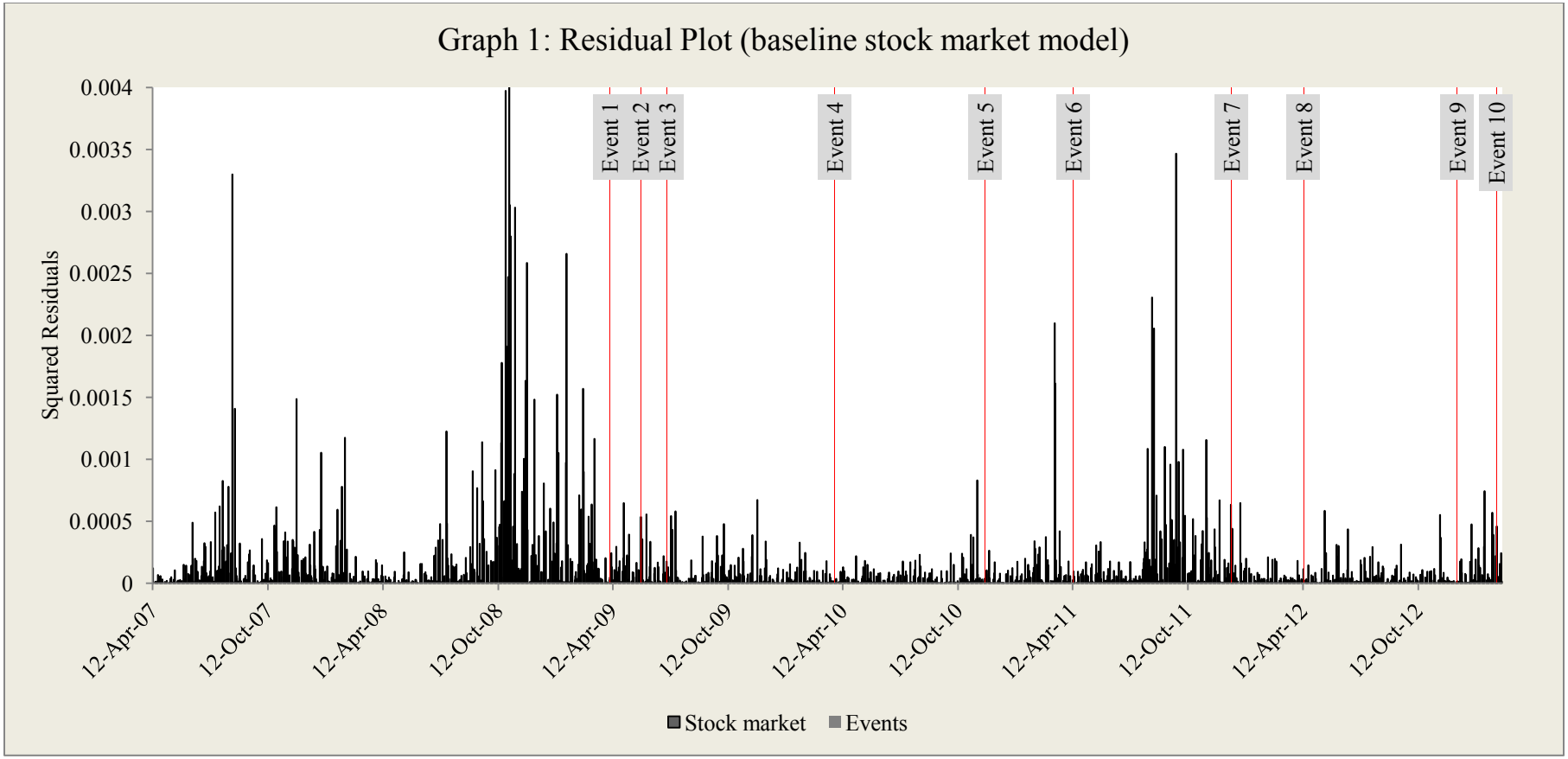


TABLE 6: CHANGE IN THE USD/WON EXCHANGE RATE (2)

	Events									
	Rocket Launch	Nuclear test 1	Missile test	Sinking of Cheonan	Bomb. of Yeonpyeon	Cyber Attack	Death of Kim-Jong Il	Rocket Launch 2	Satellite into Orbit	Nuclear test 2
delta_eurwon	0.775***	0.773***	0.766***	0.770***	0.604***	0.525***	0.484***	0.473***	0.360***	0.385***
	(0.0538)	(0.0519)	(0.0513)	(0.0508)	(0.0515)	(0.0401)	(0.0382)	(0.0376)	(0.0421)	(0.0413)
delta_yenwon	-0.0334	-0.0281	-0.0301	-0.0328	-0.0629	-0.0332	-0.0377	-0.0382	-0.0697**	-0.0660**
	(0.0412)	(0.0391)	(0.0381)	(0.0372)	(0.0393)	(0.0274)	(0.0295)	(0.0295)	(0.0260)	(0.0252)
ret_dowj	-0.0749***	-0.0774***	-0.0805***	-0.0987***	-0.159***	-0.187***	-0.200***	-0.203***	-0.149***	-0.152***
	(0.0205)	(0.0197)	(0.0196)	(0.0205)	(0.0242)	(0.0232)	(0.0202)	(0.0206)	(0.0200)	(0.0198)
lret_dowj	-0.152***	-0.149***	-0.149***	-0.154***	-0.134***	-0.155***	-0.156***	-0.159***	-0.157***	-0.146***
	(0.0296)	(0.0282)	(0.0276)	(0.0288)	(0.0326)	(0.0258)	(0.0227)	(0.0227)	(0.0225)	(0.0219)
leadret_dowj	-0.0393*	-0.0369	-0.0397*	-0.0451*	-0.0344	-0.0151	0.0102	0.0120	0.00568	0.00796
	(0.0197)	(0.0191)	(0.0188)	(0.0200)	(0.0237)	(0.0216)	(0.0182)	(0.0184)	(0.0178)	(0.0175)
D τ=1	-0.0144***	-0.00799	-0.00362	-0.00321	-0.00267	-0.00347	-0.00282	-0.00441	-0.00247	-0.00110
	(0.00126)	(0.00451)	(0.00474)	(0.00337)	(0.00291)	(0.00203)	(0.00267)	(0.00249)	(0.00187)	(0.00203)
D τ=2	0.00709***	-0.00416	-0.00412	-0.00442	-0.00261	-0.00583**	-0.00251***	-0.00210***	-0.00199***	-0.00160**
	(0.00118)	(0.00822)	(0.00545)	(0.00415)	(0.00290)	(0.00200)	(0.000743)	(0.000498)	(0.000394)	(0.000534)
D τ=3	-0.00571**	-0.00280	-0.000437	-0.00165	-0.00303	0.000748	0.00150	0.00345**	0.00315	0.00122
	(0.00179)	(0.00219)	(0.00260)	(0.00213)	(0.00247)	(0.00141)	(0.00207)	(0.00109)	(0.00186)	(0.00206)
D τ=4	0.00663***	0.00608***	0.00254	0.00208	0.00229	0.00115	-0.00267	-0.00240	-0.00318*	-0.00260*
	(0.00113)	(0.000680)	(0.00295)	(0.00229)	(0.00218)	(0.00316)	(0.00136)	(0.00156)	(0.00130)	(0.00115)
D τ=5	0.00619***	0.00694***	0.00569***	0.00236	0.00331	0.000905	-0.000826	0.00128**	0.0000912	0.0000790
	(0.00134)	(0.000897)	(0.00124)	(0.00279)	(0.00242)	(0.00179)	(0.00162)	(0.000427)	(0.000634)	(0.000536)
ε	0.0000429	-0.0000479	-0.00000581	0.000319	-0.0000528	0.0000892	0.000246	0.000216	0.0000201	0.0000902
	(0.000310)	(0.000318)	(0.000326)	(0.000331)	(0.000300)	(0.000231)	(0.000229)	(0.000222)	(0.000183)	(0.000180)
N	520	520	520	520	520	520	520	520	520	520
R-sq	0.744	0.742	0.737	0.733	0.555	0.530	0.516	0.515	0.419	0.434

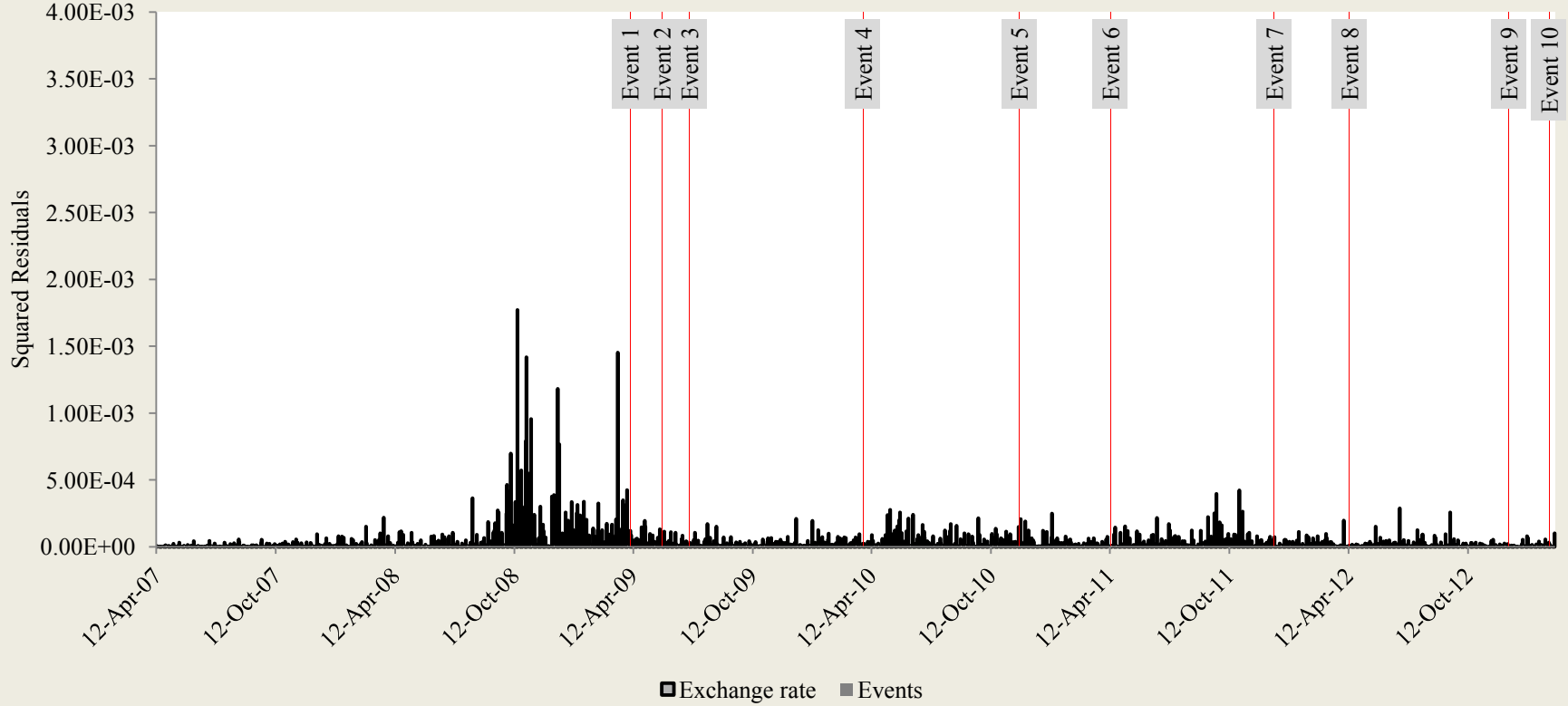
Robust standard errors in parentheses
="* p<0.05 ** p<0.01 *** p<0.001"



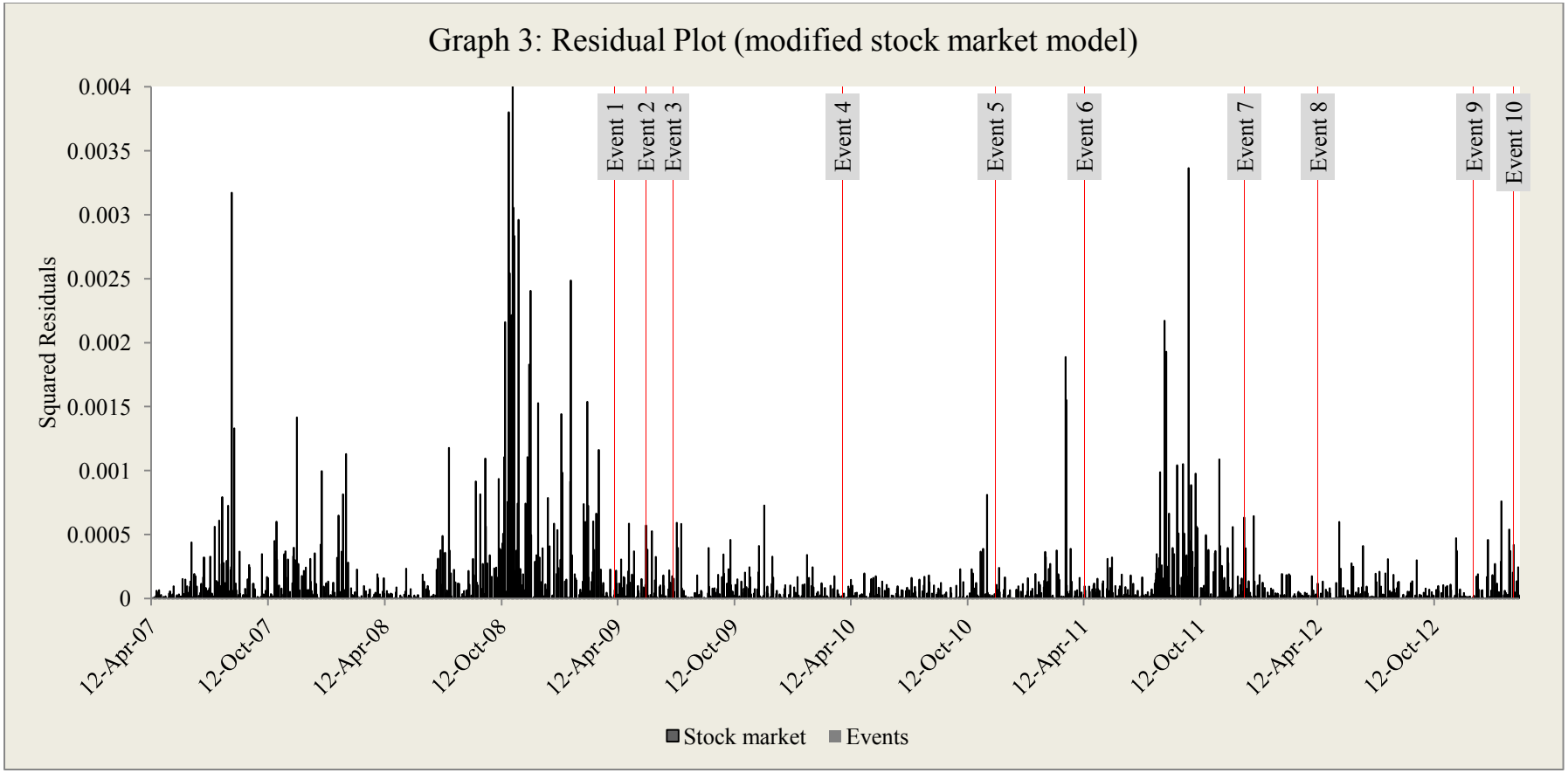
NEED NOTES

UNDER GRAPHS

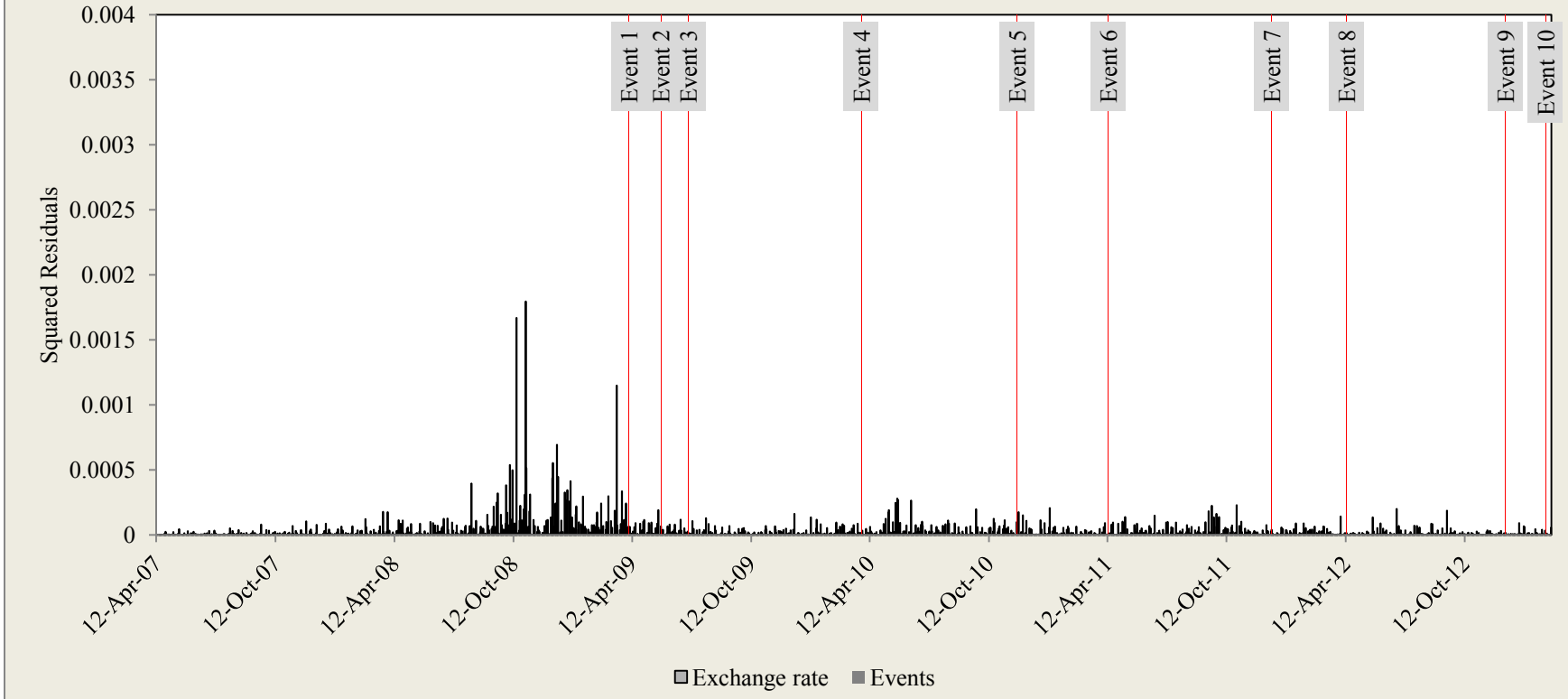
Graph 2: Residual Plot (basline exchange rate models)



Graph 3: Residual Plot (modified stock market model)



Graph 4: Residual Plot (modified exchange rate model)



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