Beta is Alive on Macroeconomic Announcement Days

Hyunho Ha
Yonsei University – School of Business
50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea
hyunhoha@yonsei.ac.kr

Jaehoon Hahn
Yonsei University – School of Business
50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea
hahnj@yonsei.ac.kr

Young Ho Eom
Yonsei University – School of Business
50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea
yheom@yonsei.ac.kr

Abstract

This study examines the impact of prescheduled macroeconomic announcements on stock returns in the Korean financial market. First, when base rate, inflation rate, and unemployment rate are released, investors obtain significantly high returns for high beta stocks on days with prescheduled macroeconomic news. This indicates that the beta is an important risk determinant to get high risk premiums on such days, or that the beta is alive on announcement days and dead on non-announcement days. Second, individual stock returns itself increase on macroeconomic announcement days, indicating that there are absolute positive effects on the individual stock returns when we receive macroeconomic news. This implies that investors require high returns for the individual stocks on announcement days because they absorb the consequent stock return risk. Third, we test the effects of the stock returns' beta on the stock returns on the macroeconomic using numerous betas using various estimating methods from asset pricing models and multivariate time-series models. Finally, we explore the various findings and implications thereof on the Korean financial market.

JEL classification: G11, G12
Keywords: CAPM, Beta, Macroeconomic announcements, Risk premium, Cross-section of stock returns

1. Introduction

The capital asset pricing model (CAPM) developed by (Sharpe, 1964), (Lintner, 1965a), and (Mossin, 1966) is one of the most important asset pricing theories. The CAPM has been used as a reliable tool for use by investors and managers to estimate stock and portfolio returns because it is simple but powerful.

The core concept of CAPM is that the expected rate of return of an individual stock has a positive linear relationship with its beta. When investors diversify with a sufficiently large number of stocks, unsystematic risk is eliminated, and only systematic risk remains. The higher the beta, measured by the stock's systematic risk, the greater the expected return. In market equilibrium, the risk premium of an individual stock is proportional to its beta. For this reason, the conclusions of CAPM are very intuitively appealing and powerfully convincing.

Although CAPM is a good asset pricing theory, most previous studies show that CAPM does not empirically explain the positive linear relationship between beta and risk premiums. (Jensen et al., 1972) reject a strictly proportional relationship between beta and a stock's expected excess return based on the traditional form of CAPM, while (Shapiro and Lakonishok, 1986) argue that there is no significantly positive relationship between market beta and individual stock returns. (Fama, E. F. and French, 1992) suggest that the traditional standard CAPM is not empirically supported, insisting that small stocks and high book-to-market ratio stocks generate higher average stock returns. In short, most CAPM research finds no direct relationship between the average excess returns of individual stocks and market beta.

However, (Savor and Wilson, 2014) report that there is a positive relationship between beta and stock returns in the U.S. stock market when macroeconomic news is announced. Using the Fama-MacBeth regression (Fama and MacBeth, 1973) and pooled regression, they find that the market beta is significantly positive and has a positive effect

on the returns of 10 beta-sorted portfolios. This indicates that stock prices behave differently on prescheduled macroeconomic announcement days, such as when the Federal Reserve releases its base interest rate or the U.S. Bureau of Labor Statistics releases the inflation rate and the unemployment rate. In other words, beta is alive on prescheduled macroeconomic announcement days and dead on non-announcement days.

First, we research the relationship between beta and stock returns in the Korean financial markets on the day of a prescheduled macroeconomic announcement; our study is the first to consider this phenomenon. We find a significantly positive relationship between beta and stock returns when such news is released, but no significant relationship on days when there is no announcement. The relationship between beta and stock returns remains significant when we include control variables such as firm size and the book-to-market ratio. Moreover, we use various methods of estimating beta to test our main hypothesis that beta has a positive effect on stock returns in the presence of macroeconomic news. For our main figures and main testing models, we use the (Dimson, 1979) beta. Robustness tests are conducted using beta estimated by simple CAPM, the dynamic conditional correlation (DCC) beta (Engle, 2002) (Bali et al., 2017), upside beta (Atilgan et al., 2018), downside beta (Atilgan et al., 2018), and expected shortfall implied beta (Liu, 2019).

Second, we research the trade-off between macroeconomic news and individual stock returns in financial markets. While investors do not know what the macroeconomic news will be, they do know that the news will be announced. A rational investor will take the risk of the impact of macroeconomic news and demand an equity risk premium. We compare and analyze the volatility and returns of stocks on macroeconomic announcement days and non-announcement days to arrive at our conclusions. In addition, using a pooled regression that includes an announcement dummy variable as an explanatory variable, we find that macroeconomic news is an important source of equity premiums on announcement days.

We use three types of macroeconomic announcements to derive our main conclusions—the announcement of the base rate from the Bank of Korea (BOK) and the consumer price index (CPI) and unemployment rate (EMP) announcements from Statistics Korea. In addition, gross domestic product (GDP) from Bank of Korea, the balance of trade (BOT) from Bank of Korea, and the index of manufacturing production (IMP) from Statistics Korea are used for robustness checks.

The study of Korean financial markets is worthwhile. Based on the World Federation of Exchanges database, the market capitalization of listed domestic companies in Korea (measured in U.S. dollars) make it the 11th largest stock market in the world. In addition, Korea is ranked 10th based on the International Monetary Fund's estimates of the nominal GDP rankings of countries in 2020. Thus, researching the Korean stock markets is very important.

2. Data

To calculate daily stock returns, we use the adjusted closing price of common stocks in the KOSPI and KOSDAQ markets between January 2003 and December 2019. The market return is the value-weighted return of the KOSPI and KOSDAQ markets. The 91-day CD rate is used as a substitute for the risk-free rate. We also obtain the companies' book values and market capitalizations to create the control variables; these variables are downloaded from *DataGuide* (www.dataguide.co.kr). We use the dates of the announcements of the consumer price index, unemployment rate, and base rate as prescheduled macroeconomic announcement days. In addition, the gross domestic product, balance of trade, and index of manufacturing production announcements are used to check the robustness of our main results.

The values of and dates when the inflation rate, unemployment rate, and index of manufacturing production are announced come from the website of Statistics Korea (http://kostat.go.kr/). The announcement dates and values for the base rate, gross domestic

production, and balance of trade, which are made by the central bank, are available from the Bank of Korea's website (http://www.bok.or.kr/). The sample period for the macroeconomic announcements is January 2004 to December 2019.

3. Methodology

3.1 Estimation of the market beta

Because the most important variable in our study is the market beta, we estimate it using various methods. We use the beta derived by (Dimson, 1979) beta, beta using the DCC model developed by Engle (2002), the expected shortfall implied beta of Jinjing Liu (2019), downside beta, upside beta, and the beta estimated using simple CAPM regression. Various types of betas are needed to study whether beta's effect on stock returns on macroeconomic announcement days differs. The methods used to estimate beta are described in the following subsections.

3.1.1 (Dimson, 1979) beta

(Dimson, 1979) beta is adjusted for infrequently traded stocks and its estimation is defined in Eq. (1).

$$\beta_{i,Dimson} = \sum_{k=-5}^{k=5} \hat{b}_{i,k} \tag{1}$$

where $\hat{b}_{i,k}$ are the estimated slope coefficients of the excess market returns from the regression model in Eq. (2):

$$R_{i,t} - R_{f,t} = a_i + \sum_{k=-5}^{k=5} b_{i,k} \left(R_{m,t+k} - R_{f,t+k}\right) + \varepsilon_{i,t} \tag{2}$$

(Dimson, 1979) beta has no unwanted bias because beta is estimated using frequently traded stocks; moreover, it is the most widely used beta. For these reasons, we first use this beta and the (Fama and MacBeth, 1973) regression and pooled regressions to examine our questions about the effects of beta on stock returns on macroeconomic announcement days and non-macroeconomic announcement days.

3.1.2 Beta using dynamic conditional correlation model (Engle, 2002)

$$\beta_{i,DCC} = \frac{Covariance(R_i - R_f, R_m - R_f)_{DCC}}{Variance(R_m - R_f)_{DCC}} \tag{3}$$

We also estimate market beta using the covariance and variance from DCC (Engle, 2002) model. We use DCC (Engle, 2002) model to calculate the volatility dynamics and conditional correlations. The model's advantage is that it can estimate the time-varying conditional covariance. Moreover, the advantage of the beta estimated using DCC (Engle, 2002) model weights more recent observations within an estimation window (Bali et al., 2017). The DCC multivariate GARCH model (Engle, 2002) is represented in the following:

The vector of asset returns follows the VAR(1) (Sims, 1980) process:

$$r_t = c + ar_{t-1} + \varepsilon_t \tag{4}$$

where r_t is the $n \times 1$ vector of the asset returns. ε_t is the $n \times 1$ vector of the residuals. The residuals ε_t is expressed as:

$$\varepsilon_t = H_t^{1/2} z_t \tag{5}$$

where z_t is the $n \times 1$ Gaussian white-noise process. H_t is the conditional variance-covariance matrix of VAR(1) residuals.

The expected value of the residuals is:

$$E(\varepsilon_t) = E\left(H_t^{\frac{1}{2}} z_t\right) = H_t^{1/2} E(z_t) = 0 \tag{6}$$

The variance of the residuals is:

$$E(\varepsilon_t \varepsilon_t') = E\left(H_t^{\frac{1}{2}} z_t z_t' H_t'^{\frac{1}{2}}\right) = H_t^{\frac{1}{2}} E(z_t z_t') H_t'^{\frac{1}{2}} = H_t^{\frac{1}{2}} I_n H_t'^{\frac{1}{2}} = I_n H_t = H_t \qquad (7)$$

The DCC model decomposes the conditional variance-covariance matrix H_t into two parts: conditional volatilities and conditional correlations.

H_t can be written as:

$$H_t = D_t R_t D_t (= \rho_{ij,t} \sqrt{h_{ii,t} h_{jj,t}}) \qquad (8)$$

D_t is the diagonal matrix of the conditional standard deviations. The diagonal elements in the matrix are computed using the GARCH(1,1) model (Bollerslev, 1986).

$$D_t = diag\left(h_{11,t}^{\frac{1}{2}}, \ldots, h_{nn,t}^{\frac{1}{2}}\right) = \begin{bmatrix} h_{11,t}^{\frac{1}{2}} & 0 & \cdots & 0 \\ 0 & h_{22,t}^{\frac{1}{2}} & \ldots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \ldots & h_{nn,t}^{\frac{1}{2}} \end{bmatrix} \qquad (9)$$

$$h_{ii,t} = \omega_i + \alpha_i \varepsilon_{i,t-1}^2 + \beta_i h_{ii,t-1}, i = 1, \ldots, n \qquad (10)$$

R_t is the dynamic conditional correlation matrix of residuals ε_t.

$$\begin{aligned} R_t &= diag Q_t^{-\frac{1}{2}} Q_t diag Q_t^{-\frac{1}{2}} \\ &= diag\left(q_{11,t}^{-\frac{1}{2}}, \ldots, q_{nn,t}^{-\frac{1}{2}}\right) Q_t diag\left(q_{11,t}^{-\frac{1}{2}}, \ldots, q_{nn,t}^{-\frac{1}{2}}\right) \end{aligned} \qquad (11)$$

Q_t is the symmetric positive definite matrix.

$$Q_t = (1 - \lambda_1 - \lambda_2)\bar{Q} + \lambda_1 z_{t-1} z'_{t-1} + \lambda_2 Q_{t-1} \quad (12)$$

$\bar{Q}$ is the unconditional correlation matrix of residuals z_t.

The parameters λ_1 and λ_2 are scalars. In addition, the constraint is $\lambda_1 + \lambda_2 < 1$ to obtain the stationary process. The elements of Q_t is $q_{ij,t}$. $q_{ij,t}$ follows the GARCH model (Bollerslev, 1986).

$$q_{ij,t} = (1 - \lambda_1 - \lambda_2)\overline{\rho_{ij}} + \lambda_1 z_{t-1} z'_{t-1} + \lambda_2 q_{ij,t-1} \quad (13)$$

$\rho_{ij,t}$ is the DCC estimator. $\rho_{ij,t}$ can be written as:

$$\rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{ii,t} q_{jj,t}}} \quad (14)$$

3.1.3 Expected shortfall implied beta of (Liu, 2019)

The expected shortfall (ES) implied beta from (Liu, 2019) is defined in equation (15):

$$\beta_{i,ES} = \rho_{ES,\alpha} \frac{\sigma_i}{\sigma_m} \quad (15)$$

where $\rho_{ES,\alpha}$ is the ES implied correlation between an individual stock's excess return and the market excess return at α-quantile. σ_i is the standard deviation of asset *I*, and σ_m is the standard deviation of the market return.

The definition of the ES of asset *i* with probability level α is the mean of the returns that fall below the α-quantile (q_α).

$$ES_{i,\alpha} = E(R_i | R_i \leq q_\alpha) \quad (16)$$

Based on (Liu, 2019), the ES-implied correlation between asset 1 and asset 2 is computed using Eq. (19).

$$\rho_{ES,\alpha} = \frac{(ES_{p,\alpha} - \mu_p)^2 - {w_1}^2\left(ES_{1,\alpha} - \mu_1\right)^2 - {w_2}^2(ES_{2,\alpha} - \mu_2)^2}{2w_1 w_2(ES_{1,\alpha} - \mu_1)(ES_{2,\alpha} - \mu_1)} \tag{17}$$

3.1.4 Downside beta (Atilgan et al., 2018)

$$\beta_{Downside} = \frac{Covariance(R_i - R_f, R_m - R_f | R_m - R_f < 0)}{Variance(R_m - R_f | R_m - R_f < 0)} \tag{18}$$

Downside beta is used when stock markets are bearish because we hypothesize that the downside beta has much greater explanatory power than the standard market beta in negative markets. According to previous studies, a stock market recession means that the market excess return is lower than its previous year's mean. Previous definitions of recessions indicate that they are time dependent. Therefore, choosing new cutoff points, we compute the downside beta. The cutoff points are not affected by the past empirical distribution of the market return; we set the cutoff point as zero.

$R_i - R_f$ is the excess return of individual stock i; $R_m - R_f$ is the excess market return; Cov is the operator of the covariance between the two variables. Var is the variance operator. To be specific, $Cov(R_i - R_f, R_m - R_f | R_m - R_f < 0)$ is the covariance between the excess individual stock return and excess market return in bear markets. $Var(R_m - R_f | R_m - R_f < 0)$ is the variance of the excess market return in negative markets.

3.1.5 Upside beta (Atilgan et al., 2018)

$$\beta_{Upside} = \frac{Covariance(R_i - R_f, R_m - R_f | R_m - R_f > 0)}{Variance(R_m - R_f | R_m - R_f > 0)} \tag{19}$$

We use the upside beta when stock markets are bullish because we hypothesize that the upside beta has much greater explanatory power than the standard market beta in positive markets. The process used to estimate the upside beta is exactly the opposite of the process used to estimate the downside beta.

3.1.6 Beta estimated by simple CAPM regression

$$\beta_{i,CAPM} = \frac{Covariance(R_i - R_f, R_m - R_f)_{CAPM}}{Variance(R_m - R_f)_{CAPM}} \tag{20}$$

$Covariance_{CAPM}$ is the covariance between excess individual stock returns and the excess market return. $Variance_{CAPM}$ is the variance of the excess market.

3.2 Fama-MacBeth (Fama and MacBeth, 1973) regression

We perform the Fama-MacBeth regression (Fama and MacBeth, 1973) and compute the regression coefficients separately for announcement and non-announcement days. In the first step, we run a cross-sectional regression of the dependent variable on the independent variables. Therefore, our cross-sectional regression specification is as shown in Eqs. (21) and (22).

$$R^A_{i,t+1} - R^A_{f,t+1} = \gamma^A_0 + \gamma^A_1 \hat{\beta}_{i,t} \tag{21}$$

$$R^N_{i,t+1} - R^N_{f,t+1} = \gamma^N_0 + \gamma^N_1 \hat{\beta}_{i,t} \tag{22}$$

$R^A_{i,t+1} - R^A_{f,t+1}$ is the excess return on the test asset on announcement days and $R^N_{i,t+1} - R^N_{f,t+1}$ is the excess return on the test asset on non-announcement days. $\hat{\beta}_{i,t}$ is test asset

i's stock market beta at time t. $\hat{\beta}_{i,t}$ is estimated using daily stock returns and various forecasting methods. We obtain a time series of intercept and slope coefficients $\gamma_{0,t}, \gamma_{1,t}$.

The second step is to compute the time-series averages of the periodic cross-sectional regression coefficients including $\gamma_{0,t}, \gamma_{1,t}$. To examine whether the average coefficient is statistically different than zero, we calculate the standard errors and associated t-statistics.

3.3 Pooled regression (panel regression)

We conduct a single regression using panel data to test whether market beta coefficients are significantly different on announcement days and non-announcement days. The regression specification is found in Eq. (23).

$$R_{i,t+1} - R_{f,t+1} = \gamma_0 + \gamma_1 \hat{\beta}_{i,t} + \gamma_2 Ann_{t+1} + \gamma_3 \hat{\beta}_{i,t} Ann_{t+1} \quad (23)$$

$R_{i,t+1} - R_{f,t+1}$ is the excess return on the test asset. Ann_{t+1} is a dummy variable that equals 1 if day $t+1$ is an announcement day and 0 otherwise. Newey-West standard errors are used for the regression because they are robust to heteroskedasticity and autocorrelation of the residuals.

4. Results

4.1 Summary statistics of macroeconomic news announcements

[Table 1 here]

Table 1 describes the macroeconomic announcement dates used in this study. We are interested in macroeconomic announcements to find the effects of beta on stock returns on the announcements and the effects of the announcements themselves.

BOK is base rated announced by Bank of Korea. CPI is consumer price index announced by Statistics Korea. EMP is unemployment rate announced by Statistics Korea. GDP is gross domestic production announced by Bank of Korea. BOT is balance of trade announced by Bank of Korea. IMP is index of manufacturing production announced by Statistics Korea.

The data sampling period is from 2004 to 2019. BOK, CPI, and EMP announcements account for 4.30%, 4.54%, and 4.57%, respectively, of the total trading days; these announcements are used to reach the study's main conclusions. The remaining three announcements (GDP, BOT, IMP) are used for robustness checks.

4.2 Summary statistics of stock returns on macroeconomic announcement days and non-announcement days

[Table 2 here]

Table 2 presents the summary statistics of daily individual stock's excess returns on macroeconomic announcement and non-announcement days. The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced.

We analyze the contents in each panel based on how macroeconomic announcements affect individual stock returns. In Panel A, the average stock's excess return on all macroeconomic announcement days is 18.95 bps and the return on non-announcement days is -4.70 bps. The difference between the returns on all announcement days and returns on non-announcement days is 23.65 bps (*t*-statistic=64.96). It means that the difference between the returns on all announcement days and the returns on non-

announcement days is statistically significantly different at 1% level. This implies that investors think prescheduled macroeconomic announcements indicate high risk and require high return of the individual stocks.

Moreover, we need to examine the effect of each type of macroeconomic announcement on stock returns. In Panel B, the average individual stock's excess return on base interest rate announcements from the Bank of Korea (BOK) is 23.22 bps and the return on the non-announcements is -2.56 bps. The difference between the returns on the announcement days and returns on non-announcement days is 25.78bps (*t*-statistic=42.40) which is statistically significant at 1% level. In Panel C, the average individual stock's excess return on consumer price index announcements from the Statistics Korea (CPI) is 20.17 bps and the return on the non-announcements is -2.49 bps. The difference between the returns on the announcement days and returns on non-announcement days is 22.66 bps (*t*-statistic=38.51) which is statistically significant at 1% level. In Panel D, the average individual stock's excess return on unemployment rate announcements from the Statistics Korea (EMP) is 15.50 bps and the return on the non-announcements is -2.25 bps. The difference between the returns on the announcement days and returns on non-announcement days is 17.76 bps (*t*-statistic=30.28) which is statistically significant at 1% level.

Of these macroeconomic announcements, BOK announcements have the largest effect on stock returns, suggesting that interest rate decisions by the central bank are crucial announcements for investors. For this reason, we need to compare the difference between the effect of the base rate on the stock return announced by Bank of Korea and the effect of the consumer price index and the unemployment rate on the stock return announced by Statistics Korea.

In summary, there are three major types of macroeconomic announcements that affect individual stock returns. When these announcements occur, investors require high returns of individual stocks because of the high risk inherent in important macroeconomic

news. For these reasons, we also need to analyze the effect of the macroeconomic announcement itself on individual stock returns.

4.3 Average Excess Returns for 10 Beta-Sorted Portfolios on Macroeconomic Announcement Days and Non-announcement Days

4.3.1 All announcement days vs non-announcement days

[Figure 1 here]

Figure 1 illustrates this study's main findings. We examine the relationship between market beta and stock returns by separately constructing 10 beta-sorted portfolios on macroeconomic announcement days and non-announcement days. To be specific, this figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. In detail, on the announcement days, the circle points indicate the average excess returns of the 10 beta-sorted portfolios, and solid line is the regression line for the 10 circle points. Moreover, on the non-announcement days, the diamond signs indicate the average excess returns of the 10 beta-sorted portfolios and the dashed line is the regression line for the 10 diamond points. (Dimson, 1979) beta is used in the figure.

First, regressing excess individual stock returns on excess market returns, we estimate pre ranked (Dimson, 1979) betas for all stocks to construct 10 beta-sorted portfolios. The portfolios are monthly rebalanced with stocks sorted according to the beta. Second, we calculate the average excess returns of the individual stocks in the 10 beta-sorted portfolios. Third, we find the post ranking betas for each portfolio.

On announcement days, there is a strong positive relationship between beta and the average realized excess returns of the 10 beta-sorted portfolios. As beta increases by 1, the average excess return for the portfolios increases by 18.89 bps (*t*-statistic= 6.48) which is economically meaningful, and statistically significant at 1 % level. In addition, the coefficient of the intercept is 3.85 bps (t-statistic= 1.60) which is not statistically significant at 10% level. It implies that beta is alive and CAPM is right on the macroeconomic announcement days. Moreover, the adjusted *R*-squared is 82.01%. It means that most variation in the average excess return is well explained by variation in the market beta.

The results derived from the regression with macroeconomic news indicate that beta is a crucial determinant of systematic risk on the macroeconomic announcements. Financial market investors require higher returns to hold higher beta stocks when they believe they will learn significant and meaningful information about the economy on the macroeconomic announcement days. Thus, beta is alive on the prescheduled macroeconomic announcement days.

However, on non-announcement days, there is a significantly negative relationship between beta and average excess portfolio returns with a coefficient of − 12.41 bps (t-statistic=− 2.46). Simply speaking, beta is dead on non-announcement days.

The results indicate that market beta is an important measure of systematic risk on macroeconomic announcement days. Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. Figure 1 intuitively illustrates our main result: beta is alive on announcement days but dead on non-announcement days.

4.3.2 BOK announcement days vs non-announcement days

[Figure 2 here]

Figure 2 plots average excess returns against betas for 10 beta-sorted portfolios on BOK announcement days. The Bank of Korea, Korea's central bank, determines the base interest rate on BOK announcement days.

On BOK announcement days, there is a strong positive relationship between beta and the average realized excess returns of the 10 beta-sorted portfolios. As beta increases by 1, the average excess return for the portfolios increases by 11.01 bps (t-statistic=2.31) which is economically meaningful, and statistically significant at 5 % level. It indicates that beta is alive on announcement days. However, on non-announcement days, there is a statistically significant and negative relationship between beta and average excess returns. The coefficient of beta is −8.94bps (t-statistic=−1.86), which shows that beta is dead on non-announcement days. The results indicate that beta is an important measure of systematic risk on BOK announcement days. That is, economic agents demand higher returns for higher beta stocks by obtaining stock market information related to the Bank of Korea's determination of the base rate. The asset pricing theory that high-beta stocks generate high returns holds on days when the central bank's base interest rate decision announcement is scheduled.

4.3.3 CPI announcement days vs non-announcement days

[Figure 3 here]

Figure 3 reports the relationship between average beta and average excess stock returns for 10 beta-sorted portfolios on prescheduled CPI announcement days and non-announcement days. The consumer price index (CPI) is released by Statistics Korea on CPI announcement days.

There is a strong positive relationship between beta and average realized excess returns for the 10 beta-sorted portfolios on the CPI announcement dates. As beta increases by 1, the average excess return of the portfolios increases by 26.79 bps (t-statistic=11.52)

which is economically meaningful, and statistically significant at 1% level. The adjusted R-squared is 93.61% indicating that most variation in the average excess return is well explained by variation in the market beta. For these reasons, we can say that the beta effect is alive on prescheduled CPI announcement days.

However, on non-announcement days, there is a statistically significant and negative relationship between beta and average excess returns. The coefficient of beta is -9.79 bps (t-statistic=-2.01). briefly speaking, beta is dead on non-announcement days.

For these reasons, the market beta is an important measure of systematic risk on CPI announcement days. In other words, economic agents demand higher returns for higher beta stocks by obtaining the inflation rate, which is represented by the consumer price index (CPI), from Statistics Korea. The basic concept of the asset pricing theory that "high-beta stocks generate high returns" holds for prescheduled CPI announcements.

4.3.4 EMP announcement days vs non-announcement days

[Figure 4 here]

Figure4 reports the relationship between average beta and average excess stock returns for 10 beta-sorted portfolios on prescheduled EMP announcement days and non-announcement days. The unemployment rate (EMP) is released by Statistics Korea on EMP announcement days.

There is a strong positive relationship between beta and average realized excess returns for the 10 beta-sorted portfolios on the EMP announcement days. As beta increases by 1, the average excess return for the 10 beta-sorted portfolios increases by 19.38 bps (*t*-statistic=4.47) which is economically meaningful, and statistically significant at 1 % level. It indicates that the beta effect is alive on prescheduled EMP announcement days. However, on non-announcement days, there is negative relationship between beta and average excess returns. The coefficient of beta is -9.42 bps (*t*-statistic=-1.99), which is strictly negative and

statistically significant. The results mean that beta is an important measure of systematic risk on EMP announcement days. In other words, economic agents demand higher returns for higher beta stocks by obtaining the employment and unemployment rate released by Statistics Korea on EMP announcement days. These results can be interpreted that beta is alive on prescheduled EMP announcement days and dead on non-announcement days.

4.4 Average Excess Returns for 10 Beta-Sorted Portfolios Using Various Betas on Macroeconomic Announcement Days and Non-announcement Days

So far, we have examined the relationship between beta and stock return of the 10 beta-sorted portfolio using (Dimson, 1979) beta. On the macroeconomic announcement days, the relationship between the return and the beta of the portfolios is positive. However, on the non-announcement days, the relationship between the return and the beta of the portfolios is negative. These results are obtained using only (Dimson, 1979) beta.

We need to check whether beta is alive on the macroeconomic announcements by considering various betas. To be specific, we use numerous betas including beta using dynamic conditional correlation model (Engle, 2002), expected shortfall implied beta of (Liu, 2019), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), Beta estimated by simple CAPM regression.

4.4.1 Beta using dynamic conditional correlation model (Engle, 2002)

[Figure 5 here]

Figure 5 shows the relationship between market beta and stock returns by separately constructing 10 beta-sorted portfolios on macroeconomic announcement days and on non-announcement days. The beta estimated by dynamic conditional correlation model (Engle, 2002) is used. The model's advantage is that it can estimate the time-varying conditional covariance. Moreover, the advantage of the beta estimated using DCC (Engle,

2002) model weights more recent observations within an estimation window (Bali et al., 2017).

On announcement days, there is a strong positive relationship between beta and the average realized excess returns of the 10 beta-sorted portfolios. As beta increases by 1, the average excess return for the portfolios with macroeconomic news increases by 25.98 bps (*t*-statistic=21.64) which is economically meaningful, and statistically significant at 1% level. It implies that dynamic conditional beta (Engle, 2002) is alive on the macroeconomic announcement days.

However, on non-announcement days, there is a significantly negative relationship between beta and average excess portfolio returns with a coefficient of −3.63 bps (*t*-statistic=−1.99). Simply speaking, dynamic conditional beta (Engle, 2002) is dead on non-announcement days.

The results indicate that market beta is an important measure of systematic risk on macroeconomic announcement days when we use dynamic conditional beta (Engle, 2002). Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. This figure also intuitively illustrates our main result: beta is alive on announcement days but dead on non-announcement days.

4.4.2 Expected shortfall implied beta of (Liu, 2019)

[Figure 6 here]

Figure 6 presents the relationship between the expected shortfall implied beta (Liu, 2019) and stock returns by separately constructing 10 beta-sorted portfolios on macroeconomic announcement days and non-announcement days. The expected shortfall

implied beta (Liu, 2019), the measurement of beta considering the bear market, is used in this figure.

On announcement days, there is a strong positive relationship between beta and the average realized excess returns of the 10 beta-sorted portfolios. As beta increases by 1, the average excess return for the portfolios with macroeconomic news increases by 21.26 bps (t-statistic=12.73) which is economically meaningful, and statistically significant at 1% level. It indicates that expected shortfall implied beta (Liu, 2019) is alive on the macroeconomic announcement days. In other words, there is the risk premium for investors on the macroeconomic news.

However, on non-announcement days, there is a significantly negative relationship between beta and average excess portfolio returns with a coefficient of is −13.66 (t-statistic=−2.96). Briefly speaking, expected shortfall implied beta (Liu, 2019) is dead on the non-announcement days.

The results indicate that market beta is an important measure of systematic risk on macroeconomic announcement days when we use expected shortfall implied beta (Liu, 2019). Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. This figure also intuitively illustrates our main result: beta is alive on announcement days but dead on non-announcement days.

4.4.3 Downside beta (Atilgan et al., 2018)

[Figure 7 here]

Figure 7 shows the relationship between market beta and stock returns by separately constructing 10 beta-sorted portfolios on macroeconomic announcement days

and non-announcement days. The downside beta, the measurement of beta considering the excess market return is less than zero, is used in Figure 7.

On announcement days, there is a strong positive relationship between the beta and the average realized excess returns of the downside beta-sorted portfolios.

As beta increases by 1, the average excess return for the portfolios with macroeconomic news increases by 22.81 bps (t-statistic=10.64) which is economically meaningful, and statistically significant at 1% level. It implies that downside beta (Atilgan et al., 2018) is alive on the macroeconomic announcement days.

However, on non-announcement days, there is a significantly negative relationship between beta and average excess portfolio returns with a coefficient of −11.13 bps (t-statistic=−5.63). Simply speaking, downside beta (Atilgan et al., 2018) is dead on non-announcement days.

The results indicate that market beta is an important measure of systematic risk on macroeconomic announcement days when we use downside beta (Atilgan et al., 2018). Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. This figure also intuitively illustrates our main result: beta is alive on announcement days but dead on non-announcement days.

4.4.4 Upside beta (Atilgan et al., 2018)

[Figure 8 here]

Figure 8 shows the relationship between market beta and stock returns by separately constructing 10 beta-sorted portfolios on macroeconomic announcement days and non-announcement days. The upside beta (Atilgan et al., 2018), the measurement of beta considering the excess market return is greater than zero, is used in Figure 8.

On announcement days, there is a strong positive relationship between beta and the average realized excess returns of the 10 beta-sorted portfolios.

As beta increases by 1, the average excess return for the portfolios with macroeconomic news increases by 12.08 bps (*t*-statistic=4.48) which is economically meaningful, and statistically significant at 1% level. It implies that upside beta (Atilgan et al., 2018) is alive on the macroeconomic announcement days.

However, on non-announcement days, there is a significantly negative relationship between beta and average excess portfolio returns with a coefficient of −10.07 bps (*t*-statistic==−4.39). Briefly speaking, upside beta (Atilgan et al., 2018) is dead on non-announcement days.

The results indicate that market beta is an important measure of systematic risk on macroeconomic announcement days when we use upside beta (Atilgan et al., 2018). Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. This figure also intuitively illustrates our main result: beta is alive on announcement days but dead on non-announcement days.

4.4.5 Beta estimated by simple CAPM regression

[Figure 9 here]

In Figure 9, we examine the relationship between beta and stock returns by separately constructing 10 beta-sorted portfolios on macroeconomic announcement days and non-announcement days. The beta estimated by simple CAPM regression is used in Figure 9.

On announcement days, there is a strong positive relationship between beta and the average realized excess returns of the 10 beta-sorted portfolios. This is because as beta

increases by 1, the average excess return for the portfolios with macroeconomic news increases by 17.83 bps (t-statistic= 8.72) which is economically meaningful, and statistically significant at 1% level. The adjusted R-squared is 89.30%. It implies that beta is alive on the macroeconomic announcement days.

However, on non-announcement days, there is a significantly negative relationship between beta and average excess portfolio returns with a coefficient of −10.79 bps (t-statistic=−7.30). Simply speaking, beta is dead on non-announcement days.

The results indicate that market beta is an important measure of systematic risk on macroeconomic announcement days when we use beta estimated by simple CAPM regression. Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. In short, beta is alive on announcement days but dead on non-announcement days.

4.5 Portfolio Analysis: Beta, Return, and Macroeconomic Announcement Days

4.5.1 Fama-MacBeth (Fama and MacBeth, 1973) regression and pooled regression for 10 beta-sorted portfolios using (Dimson, 1979) beta

[Table 3 here]

Table 3 presents the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily excess returns for 10 beta-sorted portfolios on all macroeconomic announcement and non-announcement days, and the results of the OLS regression of daily excess returns for 10 beta-sorted portfolios on their betas on prescheduled macroeconomic announcement days. The portfolios are monthly rebalanced based on (Dimson, 1979) beta. Announcement days are the days when the inflation rate, unemployment rate, and base rate

are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea.

In the left-hand side of Table 3, we can find the relationship between beta and portfolio return using Fama-MacBeth (Fama and MacBeth, 1973) regression on announcement days and non-announcement days. The coefficient of beta on the announcement days (γ_1^A) is 26.51 bps (*t*-statistic=4.24) implying a positive equity risk premium with macroeconomic news. It means that beta is alive on the announcements. However, the coefficient of beta on the non-announcement days (γ_1^N) is -6.96 bps (*t*-statistic=-2.67) implying a negative risk premium. It means that beta is dead on the non-announcement days.

In the right-hand side of Table 3, we analyze the 10 beta-sorted portfolio returns by adding three explanatory variables including (*Beta, Ann, Ann×Beta*) to the regression model. The coefficient of beta on all days (γ_1) equals 2.82 bps (*t*-statistic=1.13) which is not statistically significant meaning that beta is dead in full-sample periods (announcement days and non-announcement days). In addition, the coefficient of Announcement (γ_2) equals 1.22 bps (*t*-statistic=0.21) that is not statistically significant indicating that there is no announcement dummy effects on the portfolio returns. However, the coefficient of the interaction term between beta and the announcement (γ_3) equals 23.83 bps (*t*-statistic=4.07) which is positive and statistically significant at 1% level. It means that beta is alive on the macroeconomic announcement days.

Based on the results derived by the analysis using Fama-MacBeth (Fama and MacBeth, 1973) regression and pooled regression, we can say that there is statistically significant and positive relationship market beta and stock returns of 10 beta-sorted portfolios. In short, beta is alive on the prescheduled macroeconomic announcement days.

4.5.2 Fama-MacBeth Regression and Pooled Regression for 10 Beta-Sorted Portfolios Using Various Betas

[Table 4 here]

Table 4 reports the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily excess returns for 10 beta-sorted portfolios on all macroeconomic announcement and non-announcement days and the results of the OLS regression of daily excess returns for 10 beta-sorted portfolios on their betas on prescheduled macroeconomic announcement days. The portfolios are monthly rebalanced based on various betas including expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), and beta estimated by CAPM regression in Panel A, B, C, D, and E, respectively. By using various betas, we can verify whether or not only certain betas have a positive effect on the return at the time of announcement.

In the left-hand side of Table 4, we can find the relationship between beta and portfolio return using Fama-MacBeth (Fama and MacBeth, 1973) regression on announcement days and non-announcement days in each panel. The coefficients of beta on the announcement days (γ_1^A) in Panel A, B, C, D, and E are 24.49 bps (*t*-statistic=3.72), 21.28 bps (*t*-statistic=3.28), 23.24 bps (*t*-statistic=5.74), 15.60 bps (*t*-statistic=2.76), and 17.91 bps (*t*-statistic=3.13), respectively. The all values are positive and statistically significant at 1% level. It implies that there are positive equity risk premiums with macroeconomic news. In addition, intercepts on the announcement days (γ_0^A) in Panel A, B, C, D, and E are -4.37 bps (*t*-statistic=-0.89), -1.83 bps (*t*-statistic=-0.48), -4.42 bps (*t*-statistic=-1.22), 2.61 bps (*t*-statistic=0.54), and -0.15 bps (*t*-statistic=-0.04), respectively. The values of intercepts (γ_0^A) are statistically insignificant. For these reasons, even with various betas, CAPM holds on the macroeconomic announcement days. It means that beta is alive with the macroeconomic news on the announcements.

However, we can find the opposite results on non-announcement days. The coefficients of beta on the non-announcement days (γ_1^N) in Panel A, B, C, D and E are -11.56 bps (*t*-statistic=-3.98), -11.23 bps (*t*-statistic=-3.77), -11.76 bps (*t*-statistic=-4.42), -

10.54 bps (*t*-statistic=-4.11), and -11.35 bps (*t*-statistic=-4.43), respectively. The all values are negative and statistically significant at 1% level. It implies that there are negative equity risk premiums with macroeconomic news. It indicates that beta is dead on the non-announcement days.

In the right-hand side of Table, we analyze the 10 beta-sorted portfolio returns using various beta by adding three explanatory variables including (*Beta, Ann, Ann×Beta*) to the regression model in each panel. Our main interest is the coefficient of interaction term between *Ann* and *Beta*. The coefficients of *Ann×Beta* (γ_3) in Panel A, B, C, D and E are 28.11 bps (*t*-statistic=5.07), 26.50 bps (*t*-statistic=5.05), 28.12 bps (*t*-statistic=5.14), 22.21 bps (*t*-statistic=3.92), and 24.97 bps (*t*-statistic=4.80), respectively. The coefficients (γ_3) are positive and significantly different from zero at 1% level. It means that beta is alive on the macroeconomic announcement days. Moreover, the coefficients of *Ann* (γ_2) in the pooled regressions in Panel A, B, C, D and E are -2.74 bps (*t*-statistic=-0.51), -1.79 bps (*t*-statistic=-0.36), -2.79 bps (*t*-statistic=-0.52), 3.36 bps (*t*-statistic=0.59), and 0.47 bps (*t*-statistic=0.09), respectively. The values of coefficients are not statistically significant implying that there is no announcement itself effect on the portfolio returns. In addition, the coefficients of *Beta* (γ_1) in Panel A, B, C, D and E are -1.43 bps (*t*-statistic=-0.57), -2.79 bps (*t*-statistic=-1.21), -3.40 bps (*t*-statistic=-1.39), -3.54 bps (*t*-statistic=-1.38), and -4.55 bps (*t*-statistic=-1.96), respectively. The values of coefficients are negative or statistically not significant. It is interpreted that beta generally is dead in full sample periods (announcement days and non-announcement days).

Based on the results derived by the analysis using Fama-MacBeth (Fama and MacBeth, 1973) regression and pooled regression, we can say that there is statistically significant and positive relationship market beta and stock returns of 10 beta-sorted portfolios on prescheduled macroeconomic announcement days. In short, beta is alive with macroeconomic news on the announcements.

4.6 Individual Stock Analysis: Beta, Return, and Macroeconomic Announcement Days

4.6.1 Fama-MacBeth regression of individual stock return on (Dimson, 1979) beta on macroeconomic announcement days and non-announcement days

[Table 5 here]

Table 5 presents the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily average excess returns for 10 beta-sorted portfolios on market beta and control variables on macroeconomic announcement and non-announcement days. (Dimson, 1979) betas are used for the regressions. The macroeconomic announcement days are the days when the inflation rate, unemployment rate, and base rate are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea.

First, in Panel A, we analyze the relationship between the market beta and individual stock return considering all macroeconomic announcement days (BOK, CPI, EMP).

On macroeconomic announcement days, the average coefficient of beta is 5.12 bps (*t*-statistic=3.77), which is strongly positive and statistically significant at the 1% level. This indicates that there is a positive relationship between estimated beta and future individual stock returns, which follows the core concept of the CAPM developed by (Sharpe, 1964), (Lintner, 1965a), (Lintner, 1965b), and (Mossin, 1966). However, on non-announcement days, we obtain a negative average coefficient of beta, −2.22 (*t*-statistic=−3.39), meaning that beta is dead on non-announcement days.

Second, in Panel B, we research the effect of beta on individual stock return on BOK announcement days. When central bank in Korea (BOK: Bank of Korea) announce base rate, the average coefficient of beta is 5.05 bps (*t*-statistic=2.32). The value indicates

positive equity risk premium which is statistically significant at 5% level. It means that there is positive relationship between the estimated beta and future individual stock returns. However, on non-announcement days, we get negative equity risk premium. This is because the average coefficient of beta is -1.49 bps (*t*-statistic=-2.32). In short, beta is alive when central bank in Korea release information of base rate but beta is dead on non-announcement days from Bank of Korea.

Third, in Panel C, we investigate the relationship between the market beta and individual stock return when we get the information of inflation rate from Statistics Korea. When Statistics Korea announce CPI (Consumer Price Index), the average coefficient of beta is 6.03 bps (*t*-statistic=2.25) which is positive and statistically significant at 5% level. However, on non-announcement days, we obtain a negative average coefficient of beta, -1.55 bps (t-statistic=-2.45).

Fourth, in Panel D, we analyze the effect of beta on individual stock return on EMP announcement days. When Statistics Korea announce unemployment rate (EMP), the average coefficient of beta is 4.58 bps (t-statistic=2.23) which is positive and statistically significant at 5% level. However, on non-announcement days, we get a negative average coefficient of beta, -1.48 bps (*t*-statistic=-2.27).

The results derived from the regression indicates that beta is a meaningful determinant of systematic risk. In addition, the results shows that CAPM's key idea that high-beta stocks generate high returns holds for announcements of macroeconomic news. These empirical findings intuitively suggest our main result. Beta has a different effect on stock returns depending on whether investors obtain macroeconomic announcements. In short, beta is alive on announcement days but dead on non-announcement days.

4.6.2 Fama-MacBeth regression of individual stock return on various betas on macroeconomic announcement days and non-announcement days

[Table 6 here]

In Table 6, we analyze the explanatory power of various betas for individual stocks on all macroeconomic announcement days using Fama-MacBeth regression. The various betas are Expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta, upside beta, rolling beta. We need to check whether beta is alive on the announcement days and beta is dead on the non-announcement days using various methods to estimate market beta.

In Panel A, the ES-implied beta (Liu, 2019) is used in the regression. The concept of expected shortfall is the mean of losses in extreme downturn. Based on the expected shortfall, the ES-implied beta in the past period has high persistence in the future period. Our main finding is that there is significantly positive cross-sectional relationship between the ES-implied beta on the stock return on the macroeconomic announcement days. The coefficient of the beta on the macroeconomic announcement is 3.13 (*t*-statistic=3.11). However, the coefficient of the beta on the non-announcement days is -0.56 (*t*-statistic=-1.64). The results indicate that investors expect high expected returns on stocks with high betas on the macroeconomic news.

In Panel B, dynamic conditional beta (Engle, 2002) is used in the regression. The advantage of the beta estimated using DCC (Dynamic Conditional Correlation) which is a multivariate GARCH model weights more recent observations within an estimation window. However, unconditional beta equally weights all observation within an estimation window. The coefficient of the dynamic conditional beta is 11.97 (*t*-statistic=3.79) on the macroeconomic announcements. The value of the coefficient is positive and statistically significant at 1% level. However, the coefficient of the beta on the non-announcement day is -4.69 (*t*-statistic=-3.53).

In Panel C, downside beta (Atilgan et al., 2018) is used in the regression. The downside beta is used when stock markets are bearish because we hypothesize that the downside beta has much greater explanatory power than the standard market beta in negative markets. The coefficient of the downside beta is 11.35 bps (*t*-statistic=3.54) when we obtain information related macroeconomic news on the announcements. The value of

the coefficient is positive and statistically significant at 1% level. On the other hand, the coefficient of the downside beta on the non-announcement day is -4.95 bps (*t*-statistic=-3.83).

In Panel D, upside beta (Atilgan et al., 2018) is used in the regression. We use the upside beta (Atilgan et al., 2018) when stock markets are bullish because we hypothesize that the upside beta has much greater explanatory power than the standard market beta in positive markets. The process used to estimate the upside beta (Atilgan et al., 2018) is exactly the opposite of the process used to estimate the downside beta (Atilgan et al., 2018). On the macroeconomic announcement days, the coefficient of the upside beta is 9.28 bps (*t*-statistic=3.55) which is positive and statistically significant at 1% level. However, on the non-announcement days, the coefficient of the upside beta is -3.05 bps (*t*-statistic=-2.64).

In Panel E, beta estimated by CAPM regression is used to research the relationship the market beta and the individual stock return on the macroeconomic announcement days and non-announcement days. To be specific, the coefficient of the beta is 15.00 bps (*t*-statistic=3.75) when we obtain information related macroeconomic news on the announcements. The value of the coefficient is positive and statistically significant at 1% level. However, the coefficient of the beta is -5.91 bps (*t*-statistic=-3.51) on the non-announcement days.

Based on the results, we can conclude that beta is alive on the prescheduled macro announcements and beta is dead on the non-announcements although we use various betas including expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), beta estimated by CAPM regression.

4.6.3 Pooled regression of daily excess returns for individual stocks on Dimson (1979) betas on macroeconomic announcement days

[Table 7 here]

Table 7 shows the results of the OLS regression of daily excess returns for individual stocks on their betas on prescheduled macroeconomic announcement days. The dependent variable is daily excess returns for individual stocks. The independent variables are *Beta*, announcement dummy variables (Ann_{All}, Ann_{BOK}, Ann_{CPI}, Ann_{EMP}), and interaction terms between announcements and betas ($Ann_{All} \times Beta$, $Ann_{BOK} \times Beta$, $Ann_{CPI} \times Beta$, $Ann_{EMP} \times Beta$). Based on the regression model, we research the explanatory power of these independent variables for the individual stock returns.

Our main results are reported in regression [1]. First, the coefficient of $Ann_{All} \times Beta$ is 6.21 bps (*t*-statistic=12.33), which is statistically significant at the 1% level. This shows that there is a strong positive relationship between beta and average excess returns for individual stocks on all macroeconomic announcement days. In other words, high-beta stocks generate high returns on announcement days. Second, the coefficient of Ann_{All} is 17.01 bps (*t*-statistic=27.82); thus, macroeconomic announcements of the BOK, CPI, and EMP themselves positively affect individual stock returns.

Regressions [2], [3], and [4] test how beta affects the individual stock returns on each type of macroeconomic announcement day. The coefficients of $Ann_{BOK} \times Beta$, $Ann_{CPI} \times Beta$, and $Ann_{EMP} \times Beta$ are 2.25 (*t*-statistic=2.70), 4.54 (*t*-statistic=5.52), and 9.70 (*t*-statistic=11.71), respectively. The coefficients of Ann_{BOK}, Ann_{CPI}, and Ann_{EMP} are 22.69 (t-statistic=22.51), 17.93 bps (t-statistic=17.98), and 7.98 bps (t-statistic=7.98).

Regression model [5] is a combination of regression models [2], [3], and [4]. The coefficients of $Ann_{BOK} \times Beta$, $Ann_{CPI} \times Beta$, and $Ann_{EMP} \times Beta$ are 2.58 (*t*-statistic=3.09), 5.14 (*t*-statistic=6.25), and 10.03 (*t*-statistic=12.10), respectively. The coefficients of Ann_{BOK}, Ann_{CPI}, and Ann_{EMP} are 23.65 (t-statistic=23.44), 19.53 bps (t-statistic=19.55), and 8.93 bps (t-statistic=8.91).

Based on these results, we can find that the effect of beta on the individual stock return on EMP announcement day ($Ann_{EMP} \times Beta$) is larger than that on other announcement days ($Ann_{BOK} \times Beta$, $Ann_{CPI} \times Beta$). In addition, the effect of base rate announcement itself by central bank (Ann_{BOK}) is larger than the effect of consumer price index announcement itself (Ann_{CPI}) and the effect of unemployment announcement itself (Ann_{EMP}).

For these reasons, macroeconomic announcement itself effect (Ann_{All}, Ann_{BOK}, Ann_{CPI}, Ann_{EMP}) and interaction effect between beta and macroeconomic announcement ($Ann_{All} \times Beta$, $Ann_{BOK} \times Beta$, $Ann_{CPI} \times Beta$, $Ann_{EMP} \times Beta$) are important to analyze the individual stock returns.

4.6.4 Pooled regression of daily excess returns for individual stocks on various betas on macroeconomic announcement days

[Table 8 here]

Table 8 shows the results of the OLS regression using variously estimated betas considering macroeconomic announcements. To be specific, the dependent variable is daily excess returns for individual stocks. The independent variables are *Beta*, announcement dummy variables (Ann_{All}) and interaction terms between announcements and beta ($Ann_{All} \times Beta$). In detail, expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), beta estimated by CAPM regression are used as one of the market betas (*Beta*) which is main independent variable.

First, our main interest in the regression is the coefficient of the interaction term between beta of individual stocks and macroeconomic announcements ($Ann_{All} \times Beta$). To be specific, the coefficients of this term are 0.89 bps (*t*-statistic=3.13), 6.24 bps (*t*-statistic=7.72), 8.93 bps (*t*-statistic=10.98), 7.19 bps (*t*-statistic=8.25), and 14.46 bps (*t*-

statistic=16.06) when we use expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), beta estimated by CAPM regression, respectively. All of the coefficients are positive and statistically significant at 1% level. For these reasons, beta is alive when we obtain information related macroeconomic news on the announcements.

Second, our additional interest is the announcement itself effect on the individual stock return (Ann_{All}). In detail, the coefficients of Ann_{All} in the regressions using expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), beta estimated by CAPM regression are 22.01 bps (t-statistic=45.02), 17.80 bps (t-statistic=22.38), 14.13 bps (t-statistic=15.65), 18.15 bps (t-statistic=25.63), and 11.32 bps (t-statistic=13.43). All of the coefficients are positive and statistically significant at 1% level. It indicates that the important component of the equity premium is compensation for macroeconomic risk which is exposure to news about the state of the economy.

For these reasons, on the macroeconomic announcement days, the individual stock returns are positively affected by the market beta and announcement itself.

4.7 The Effect of Beta on Large-Cap Stocks on Macroeconomics Announcement Days

[Table 9 here]

Table 9 analyzes the effects of beta on the individual stock returns for three size-sorted groups on all macroeconomic announcement days and non-announcement days using Fama-MacBeth (Fama and MacBeth, 1973) regression. The macroeconomic announcement days are the days when the consumer price index (CPI), unemployment rate (EMP), and base rate (BOK) are announced. The independent variables are (Dimson, 1979)

beta (*Beta*), log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). The dependent variable is the individual stock return.

Our hypothesis is that investors believe the fundamentals of stocks with large capitalization; consequently, large-cap investors are believed to be rational investors. Therefore, if the coefficient of beta is positive and large for investments in large-cap stocks on announcement days, then the investors are rational. In other words, rational investors are responsible for making beta alive on macroeconomic announcement days. Moreover, we can expect that irrational investors make beta dead on announcement days. Based on this hypothesis, we research the relationship between the market beta and the individual stock return considering the market capitalization by constructing the three size-sorted groups.

The results of the Fama-MacBeth (Fama and MacBeth, 1973) regression show that the effect of beta on the individual stock return on the macroeconomic announcement days increases as the size (or market capitalization) of the group increases.

To be specific, in small size-sorted group (Panel A and Panel B), the coefficients of betas on the announcement days are 3.04 (*t*-statistic=2.38) and 2.66 (*t*-statistic=2.06), respectively. The values of the coefficients are positive and statistically significant at 5% level. In addition, in medium size-sorted group (Panel C and Panel D), the coefficients of betas on the announcement days are 4.61 (*t*-statistic=3.05) and 5.00 (*t*-statistic=3.28), respectively. The values of the coefficients are positive and statistically significant at 1% level. Moreover, in large size-sorted group (Panel E and Panel F), the coefficients of betas on the announcement days are 7.16 (*t*-statistic=3.28) and 7.72 (*t*-statistic=3.57), respectively. The values of the coefficients are strongly positive and statistically significant at 1% level. However, the coefficients of beta on the non-announcement days are negative in all size-sorted group (Panel A, B, C, D, E, and F).

These empirical findings support our hypothesis that investors believe the fundamentals of stocks with large capitalization; consequently, large-cap investors are believed to be rational investors. This is because that the magnitude of the beta coefficient

increases and the *t*-statistic that reflects the statistical significance also increases as the size of the size-sorted group grows.

In short, rational investors make beta alive much more by investing in large-cap stocks on the macroeconomic announcement days. In other words, CAPM is suitable for rational investors when they obtain the information related to base rate, inflation rate, and unemployment rate on the announcement days.

4.8 The Effect of Beta on Stocks Invested by Foreign Investors on Macroeconomics Announcement Days

[Table 10 here]

Table 10 analyzes the effects of beta on the individual stock returns for three foreign investment-share sorted groups on all macroeconomic announcement days and non-announcement days. The macroeconomic announcement days are the days when the consumer price index (CPI), unemployment rate (EMP), and base rate (BOK) are announced. The independent variables are (Dimson, 1979) beta (*Beta*), log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). The dependent variable is the individual stock return.

Korean stocks are heavily influenced by foreign capital and foreign investors. About 70% of the stockholders of large (based on market capitalization) blue stocks are foreign investors. In addition, foreign investors are sensitive to the Korean market itself. Therefore, we need to study the beta effect on the individual stock returns considering the foreign investment-share in Korean stock markets.

We hypothesize that the beta effect on the individual stock return with a large share of foreign investors is positive and that the magnitude is greater than the beta effect on the individual stock return with small foreign investment shares. For these reasons, we

need to compare the effect of beta on stocks with a high foreign investment ratio with the effect of beta on stocks with a low foreign investment ratio.

The results are similar to those mentioned in our hypothesis. In other words, the magnitude of the beta effect in the regression analysis performed in the group with a high foreign investment ratio on the macroeconomic announcement days is larger than the magnitude of the beta effect in the regression analysis performed in the group with a low foreign investment ratio on the announcement days.

To be specific, in Panel A and Panel B (Group with a Low Proportion of Foreign Investment), the coefficients of betas are 4.35 (*t*-statistic=3.03) and 4.93 (*t*-statistic=2.98), respectively. Moreover, in Panel E and Panel F (Group with a High Proportion of Foreign Investment), the coefficients of betas are 6.06 (*t*-statistic=2.93) and 6.22 (*t*-statistic=2.88), respectively.

These empirical findings indicate that the beta effects on returns differ depending on the ratio of foreign investment-sorted portfolios on all announcement days. In detail, the stock returns of the high ratio of foreign investment-sorted groups are more sensitive to market betas than the returns of the low ratio of foreign investment-sorted groups. On non-announcement days, the betas are dead regardless of the proportion of foreign investment in the groups.

Because foreign investors are sensitive to the Korean market, on days when macroeconomic news is released, the coefficient of beta is positive and large. That is, the beta coefficient of the stock in the group with a high foreign investor ratio is large, but the beta coefficient of the stock in the group with a high foreign investor ratio is small.

Therefore, the CAPM describes the characteristics of foreign investors who are rational and value a firm's fundamentals on macroeconomic announcement days. In short, beta is alive on macroeconomic announcement days and dead on non-announcement days. Moreover, the effect of beta of individual stocks in the group sorted by the ratio of foreign investment increases as the ratio of foreign investment in the group increases when they

obtain the information related to base rate, inflation rate, and unemployment rate on the announcement days.

4.9 Time-Varying Macroeconomic Announcement Effects on Individual Stock Returns

[Figure 10 here]

Figure 10 shows the time-varying effect of macroeconomic announcement and interaction effect of beta and macroeconomic announcement on the average excess return of individual stocks. Using Eq. (25), we can estimate the effects. In Figure 5, 'Time = 0' means macroeconomic announcements are released in financial markets. 'Time=1, 2, 3' indicates that the '1 day, 2 days, 3days after the announcement'. 'Time=-1, -2, -3' explains that the '1 day, 2 days, 3days before the announcement'. Our main interests are two effects following. First is the effect of the macroeconomic announcement itself. The second is the interaction effect of beta and the announcement.

To be specific, as time goes by -3, -2, -1, 0, 1, 2, 3, the effect of macroeconomic announcement changes to -4.99 bps (*t*-statistic=-6.13), 14.09 bps (*t*-statistic=17.34), 13.20 bps (*t*-statistic=16.36), 20.40 bps (*t*-statistic=25.14), 13.96 bps (*t*-statistic=-6.13), 9.50 bps (*t*-statistic=11.78), 1.75 bps (*t*-statistic=2.17), When time is 0, the effect on individual stock returns on the announcement is highest. In other words, the macroeconomic risk premium is the largest when we face the announcement days. The risk premium increases before the announcement and the risk premium decreases after the announcement.

In addition, as time goes by -3, -2, -1, 0, 1, 2, 3, the interaction effect of beta and macroeconomic announcement changes to -1.82 bps (*t*-statistic=-2.71), 1.74 bps (*t*-statistic=2.59), 4.83 bps (*t*-statistic=7.33), 9.99 bps (*t*-statistic=0.66), 8.47 bps (*t*-statistic=0.66), 1.68 bps (*t*-statistic=2.55), -2.11 bps (*t*-statistic=-3.22). When time is 0, the effect of beta on individual stock returns on the announcement is highest. After the

announcements, the coefficient of beta decreases as time goes. It indicates that when there is an announcement, beta is strongly alive, and when there is no announcement, beta slowly dies.

In summary, the magnitude of risk premium and beta effect differs before and after the macroeconomic announcements.

4.10 The Effects of Betas on Individual Stock Returns on Other Macroeconomic Announcements – Gross Domestic Product, Balance of Trade, Index of Manufacturing Production

[Table 11 here]

So far, we have considered the relationship between the market beta and the stock return by considering only MPB (base rate released by Bank of Korea), CPI (consumer price index released by Statistics Korea), and EMP (unemployment rate by Statistics Korea). However, we need to examine the relationship taking into account other macroeconomic announcement days.

In Table 11, using Fama-MacBeth (Fama and MacBeth, 1973) regression, we analyze the relationship between market beta (Dimson, 1979) and individual stock returns on other macroeconomic announcement days. (Dimson, 1979) betas are used for the regressions. The control variables are log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). In addition, announcement days are the days when the gross domestic product (GDP), balance of trade (BOT), and index of manufacturing production (IMP) are announced. The gross domestic production, and balance of trade announcement days are released by the Bank of Korea. The index of manufacturing production is released by Statistics Korea.

In Panel A, the coefficient of beta on the individual stock return on GDP announcement day (γ_1^A) is -2.22 bps (*t*-statistic=-0.72) which is not statistically significant.

In addition, the coefficient of beta on the return on non-GDP announcement days (γ_1^N) is -1.15 bps (*t*-statistic=-1.78) which is negative and statistically significant at 10% level.

In Panel B, the market risk premium on BOT announcement day (γ_1^A) is -1.40 bps (*t*-statistic=-0.46) which is not statistically significant. In addition, the market risk premium on non-BOT announcement days (γ_1^N) is -1.18 bps (*t*-statistic=-1.83) which is negative and statistically significant at 10% level.

In Panel C, the individual stock returns decrease by 0.13 bps (*t*-statistic=-0.06) when beta goes up by 1 on IMP announcement days. The coefficient of the beta is not statistically significant. Moreover, the individual stock returns decrease by 1.24 bps (*t*-statistic=-1.95) when beta goes up by 1 on non-IMP announcement days. The coefficient of the beta is negative and statistically significant at 10% level.

Based on these empirical findings, we can conclude that beta is not alive on GDP, BOI, IMP macroeconomic announcement days. In other words, we can find the statistically significant and positive relationship between the market beta and the stock return on only BOK, CPI, EMP announcement days.

5. Conclusion

This paper researches how stock prices are related to market beta on macroeconomic announcement days. In addition, we analyze the announcement itself effects to stock return. The main macroeconomic announcement days in this paper are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. Moreover, we use various betas including (Dimson, 1979) beta, expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018) to derive our main results. Based on Fama-MacBeth (Fama and MacBeth, 1973) regression and pooled regression, we check the relationship between the market beta and stock return on the announcement days. We research the relationship based on beta-sorted portfolio analysis and individual stock

analysis. Moreover, we analyze the magnitude of the relationship considering market capitalization and proportion of foreign investment of the stocks.

The results are as follows: First, Economic agents demand higher returns for higher beta stocks by obtaining stock market information related to macroeconomic news. The key idea of CAPM that high-beta stocks generate high returns holds on prescheduled macroeconomic announcement days. Second, macroeconomic news is an important source of equity premiums on announcement days. This implies that investors require high returns on announcement days because they absorb the consequent stock return risk. Third, rational investors make beta alive by investing in large-cap stocks based on macroeconomic news. Fourth, the effect of beta on portfolio returns increases as the portfolio's ratio of foreign investment increases on macro announcements. These empirical findings are robust for various betas such as (Dimson, 1979) beta, expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018).

In conclusion, beta is alive on the macroeconomic announcement days but dead on the non-announcement days.

References

Atilgan, Y., Bali, T.G., Ozgur Demirtas, K., Doruk Gunaydin, A., 2018. Downside Beta and Equity Returns around the World. J. Portf. Manag. 44, 39–54. https://doi.org/10.3905/jpm.2018.1.080

Bali, T.G., Engle, R.F., Tang, Y., 2017. Dynamic conditional beta is alive and well in the cross section of daily stock returns. Manage. Sci. 63, 3760–3779. https://doi.org/10.1287/mnsc.2016.2536

Bollerslev, T., 1986. Generalized Autoregressive Conditional Heteroskedasticity. J. Econom. 31, 307–327.

Dimson, E., 1979. Risk measurement when shares are subject to infrequent trading. J. financ. econ. 7, 197–226. https://doi.org/10.1016/0304-405X(79)90013-8

Engle, R., 2002. Dynamic Conditional Correlation : A Simple Class of Multivariate Generalized Autoregressive Conditional Heteroskedasticity Models. J. Bus. Econ. Stat. 20, 339–350. https://doi.org/10.1198/073500102288618487

Fama, E. F. and French, K.R., 1992. The cross-section of expected stock returns. J. Finance 47(2), 427–465.

Fama, E.F., MacBeth, J., 1973. Risk, return, and equilibrium: Empirical tests. J. Polit. Econ.

Jensen, M., Black, F., Scholes, M., 1972. The Capital Asset Pricing Model: Some Empirical Tests.

Lintner, J., 1965a. Security prices, risk, and maximal gains from diversification. J. Finance 20, 587–615.

Lintner, J., 1965b. The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. Rev. Econ. Stat. 47, 13–37.

Liu, J., 2019. A Novel Downside Risk Measure and Expected Returns. Policy Res. Work. Pap. https://doi.org/10.2139/ssrn.3406944

Mossin, J., 1966. Equilibrium in a capital asset market. Econometrica. Econometrica 34, 768–783.

Newey, W.K., West, K.D., 1987. A Simple , Positive Semi-Definite , Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. Econometrica 55, 703–708.

Savor, P., Wilson, M., 2014. Asset pricing: A tale of two days. J. financ. econ. 113, 171–201. https://doi.org/10.1016/j.jfineco.2014.04.005

Shapiro, A.C., Lakonishok, J., 1986. Systematic Risk, Total Risk and Size as Determinants of Stock Market Returns. J. Bank. Financ. 10, 115–132.

Sharpe, W.F., 1964. Capital Asset Prices. J. Finance 19, 425–442.

Sims, C.A., 1980. Macroeconomics and Reality. Econometrica 48, 1–48.

Table 1. Macroeconomic announcement days

Ann.	Variables Released On Announcements	Sources	Sample Period	Total	Ratio
BOK	Base Rate	Bank of Korea	2004~2019	181 days	4.30%
CPI	Inflation Rate	Statistics Korea	2004~2019	191 days	4.54%
EMP	Unemployment Rate	Statistics Korea	2004~2019	192 days	4.57%
GDP	Gross Domestic Production	Bank of Korea	2004~2019	128 days	3.04%
BOT	Balance of Trade	Bank of Korea	2004~2019	191 days	4.54%
IMP	Manufacturing Production	Statistics Korea	2004~2019	191 days	4.54%

This table explains the macroeconomic announcement days used in this paper. BOK is base rated announced by Bank of Korea. CPI is consumer price index announced by Statistics Korea. EMP is unemployment rate announced by Statistics Korea. GDP is gross domestic production announced by Bank of Korea. BOT is balance of trade announced by Bank of Korea. IMP is index of manufacturing production announced by Statistics Korea. Sample period is 2004 to 2019.

Table 2
Summary statistics of daily individual stock excess returns on announcement days and non-announcement days

	Panel A: Ann. vs Non-ann.			Panel B: BOK vs Non-BOK		
	All	Non-all	Diff.	BOK	Non-BOK	Diff.
Mean	**18.95**	**-4.70**	**23.65**	**23.22**	**-2.56**	**25.78**
	[56.23]	**[-34.14]**	**[64.96]**	**[39.10]**	**[-19.60]**	**[42.40]**
1%	-908.80	-966.73		-897.62	-961.83	
25%	-128.18	-152.94		-124.32	-150.55	
Median	-0.66	-0.96		-0.66	-0.95	
75%	144.65	125.15		146.54	127.12	
99%	1255.05	1169.57		1279.33	1176.60	
Std.Dev.	332.37	336.88		333.04	336.46	
Skewness	0.39	0.31		0.40	0.31	
Kurtosis	7.75	7.45		7.93	7.47	
Obs.	973,049	5,979,490		314,652	6,637,887	
	Panel C: CPI vs Non-CPI			Panel D: EMP vs Non-EMP		
	CPI	Non-CPI	Diff.	EMP	Non-EMP	Diff.
Mean	**20.17**	**-2.49**	**22.66**	**15.50**	**-2.25**	**17.76**
	[35.17]	**[-19.01]**	**[38.51]**	**[27.12]**	**[-17.23]**	**[30.28]**
1%	-872.37	-963.35		-949.93	-959.85	
25%	-131.12	-150.30		-127.75	-150.45	
Median	-0.65	-0.95		-0.66	-0.95	
75%	146.61	127.06		142.04	127.29	
99%	1297.20	1176.40		1181.74	1179.37	
Std.Dev.	332.36	336.51		331.98	336.55	
Skewness	0.52	0.31		0.27	0.32	
Kurtosis	7.55	7.49		7.74	7.48	
Obs.	335,691	6,616,848		337,377	6,615,162	

Notes: Individual stock excess returns is calculated as the difference between individual stock returns and the risk-free rate. The unit of returns variables is basis points (BPS). Bold characters indicate results that are of primary interest. In Panel A, “Ann” includes days when BOK or CPI, or EMP news are announced. In detail, BOK is the date when the Bank

of Korea announces the base rate. CPI is the day Statistics Korea announces the consumer price index. EMP is the day Statistics Korea announces the unemployment rate.

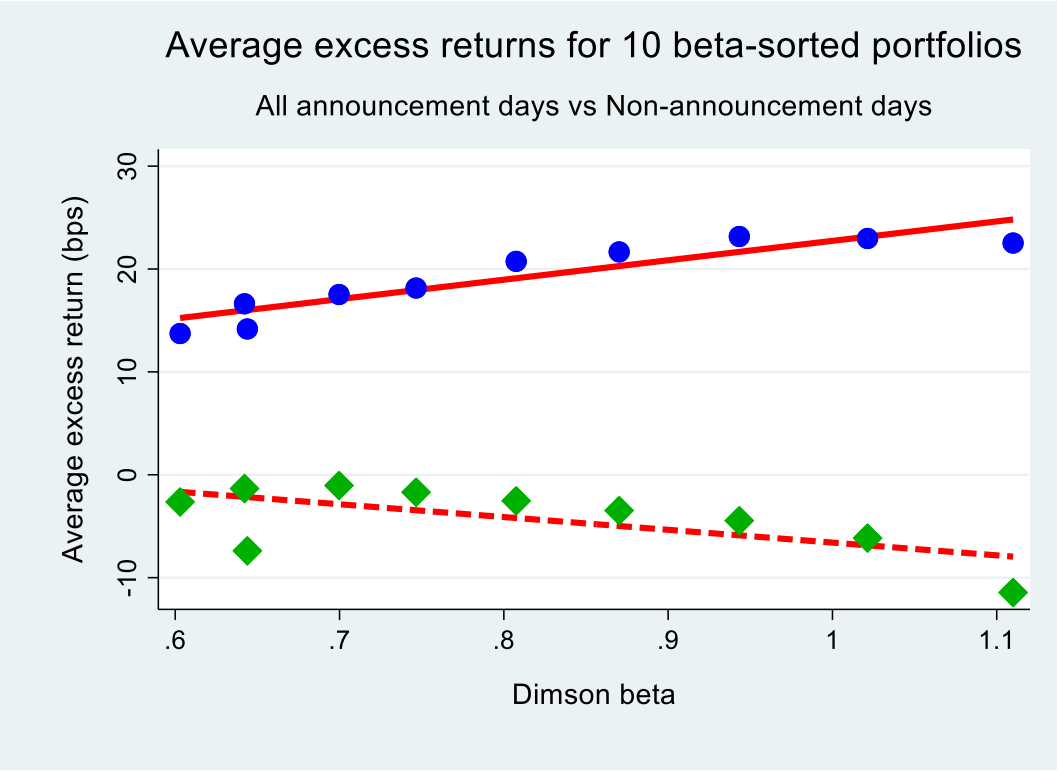

Figure 1. Average excess returns for 10 beta-sorted portfolios on all announcement days and non-announcement days

This figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is (Dimson, 1979) beta.

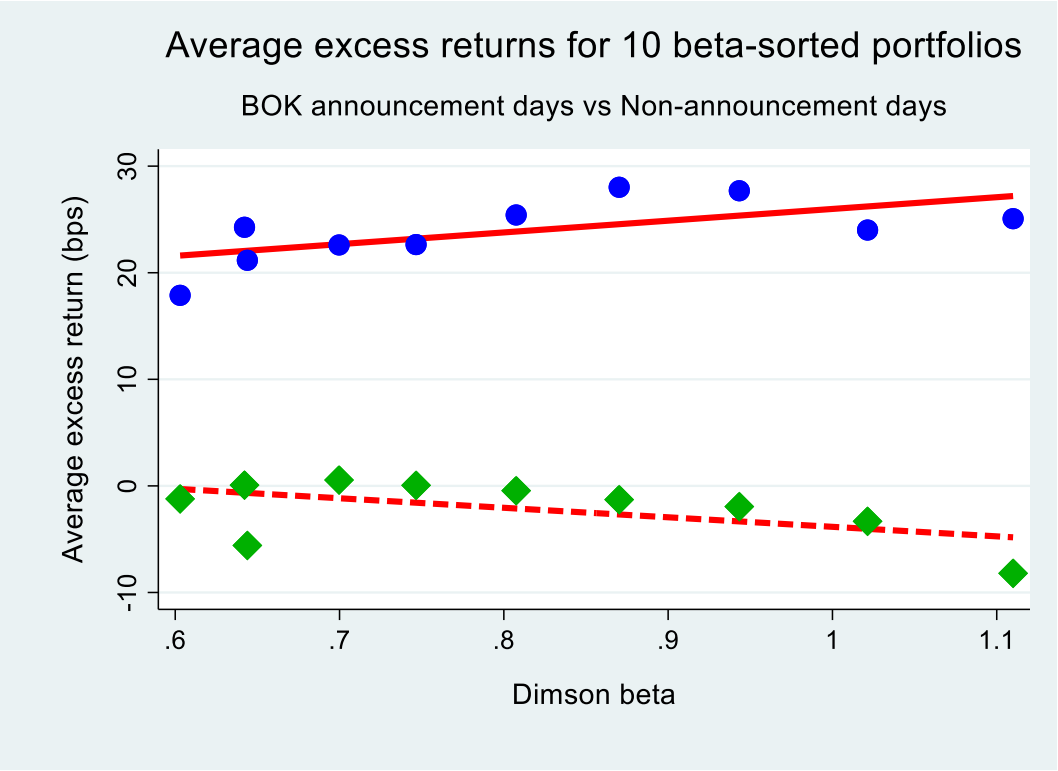

Figure 2. Average excess returns for 10 beta-sorted portfolios on BOK announcement days and non-announcement days

This figure plots average excess returns against betas for 10 beta-sorted portfolios on BOK announcement days. BOK announcement days are the days when the base rate from Bank of Korea is announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is (Dimson, 1979) beta.

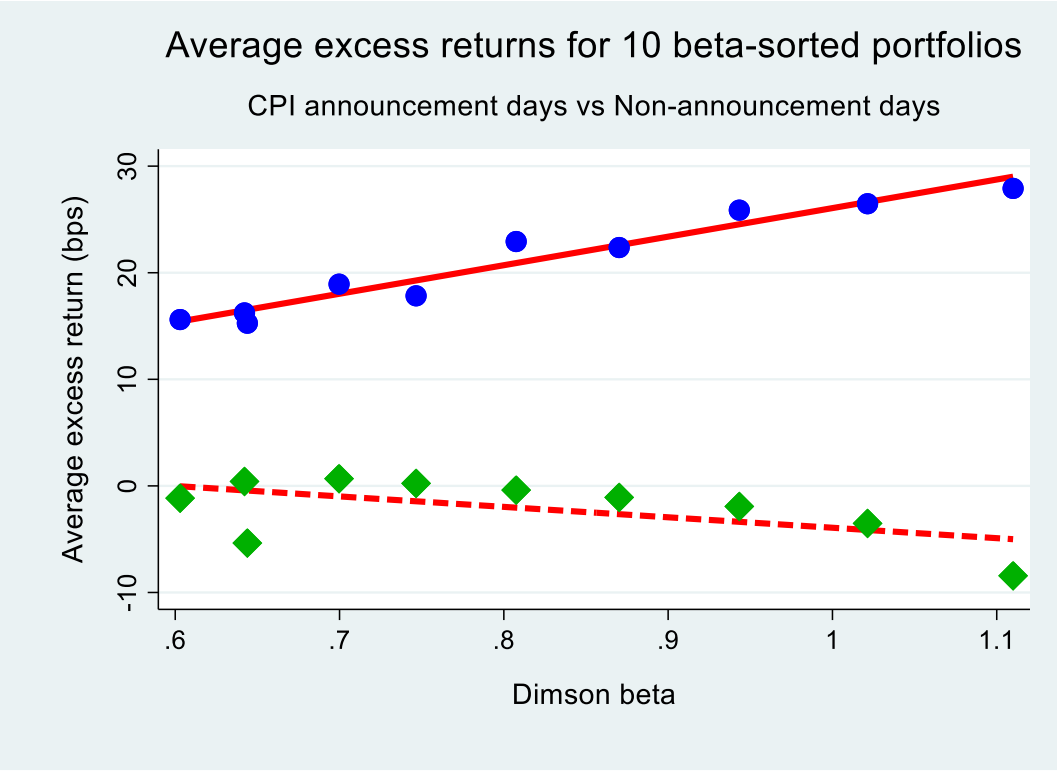

Figure 3. Average excess returns for 10 beta-sorted portfolios on CPI announcement days and non-announcement days

This figure plots average excess returns against betas for 10 beta-sorted portfolios on CPI announcement days. CPI announcement days are the days when the consumer price index from Statistics Korea is announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is (Dimson, 1979) beta.

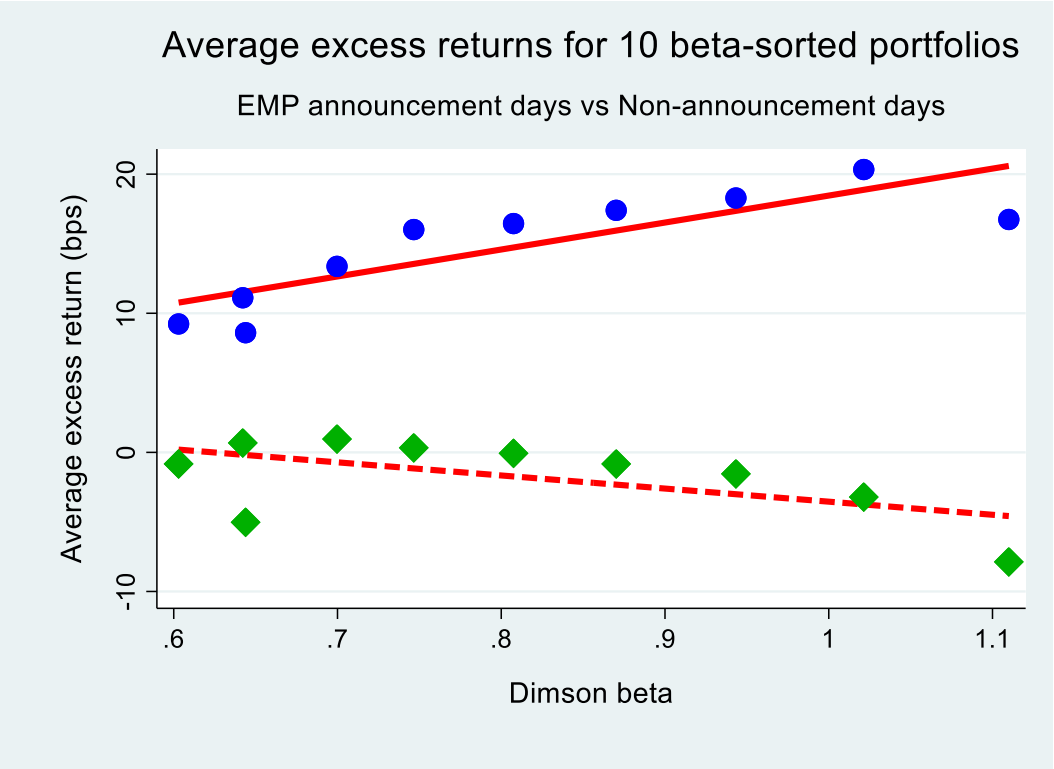

Figure 4. Average excess returns for 10 beta-sorted portfolios on EMP announcement days and non-announcement days

This figure plots average excess returns against betas for 10 beta-sorted portfolios on EMP announcement days. EMP announcement days are the days when the unemployment rate from Statistics Korea is announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is (Dimson, 1979) beta.

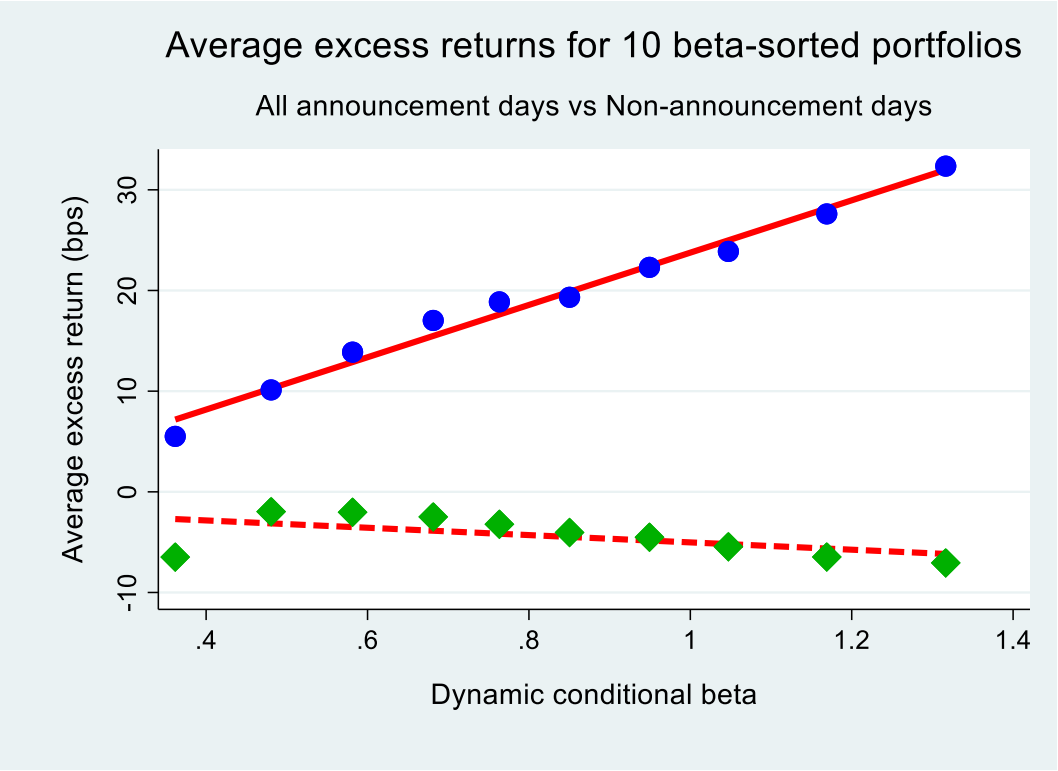

Figure 5. Average excess returns for 10 dynamic conditional beta-sorted portfolios (Engle, 2002) on all macroeconomic announcement days and non-announcement days
This figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is dynamic conditional correlation model (Engle, 2002).

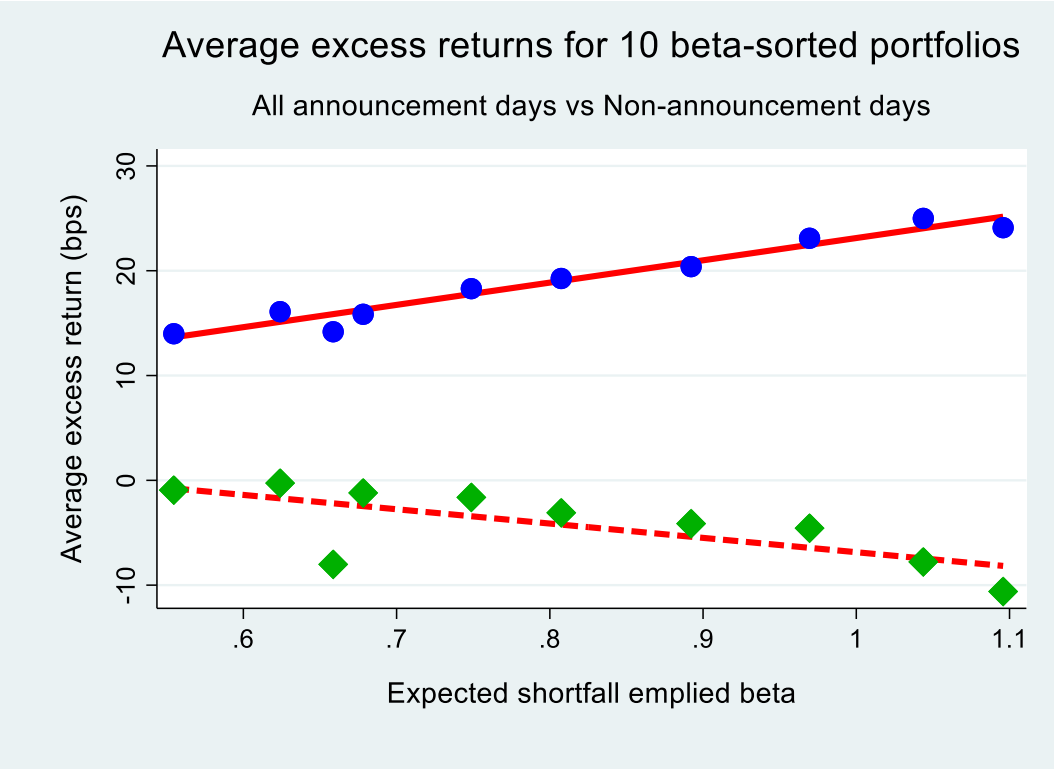

Figure 6. Average excess returns for 10 expected shortfall implied beta-sorted portfolios (Liu, 2019) on all macroeconomic announcement days and non-announcement days

This figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is expected shortfall implied beta (Liu, 2019).

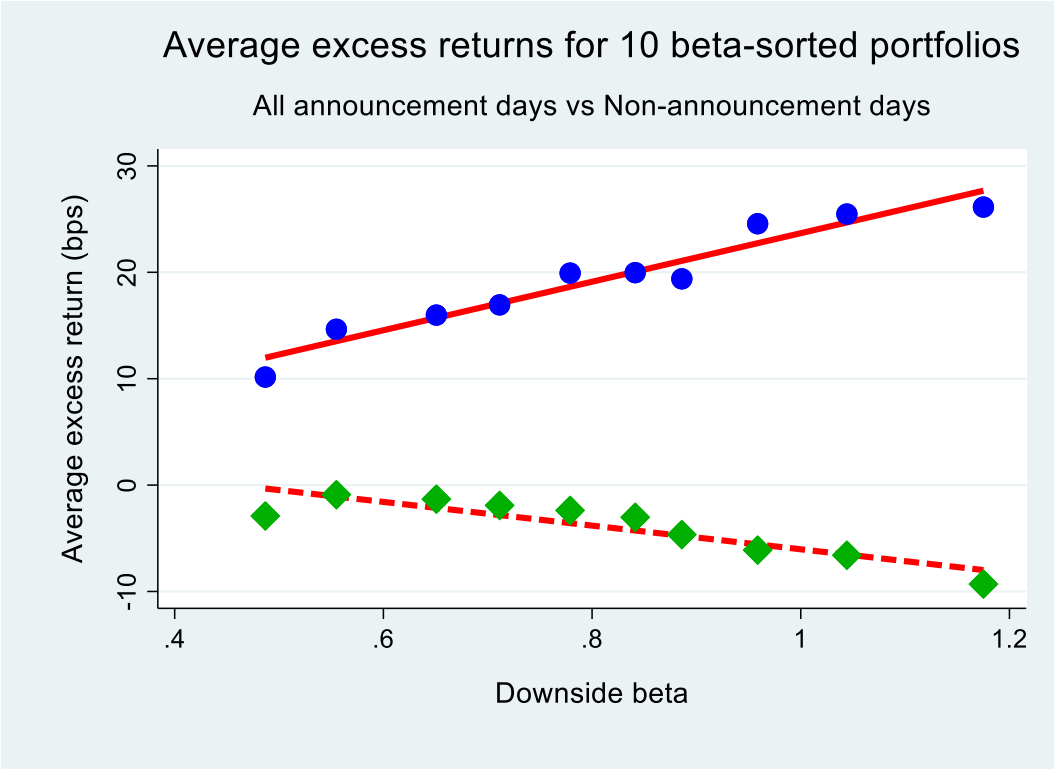

Figure 7. Average excess returns for 10 downside beta (Atilgan et al., 2018) sorted portfolios on all macroeconomic announcement days and non-announcement days
This figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is downside beta (Atilgan et al., 2018).

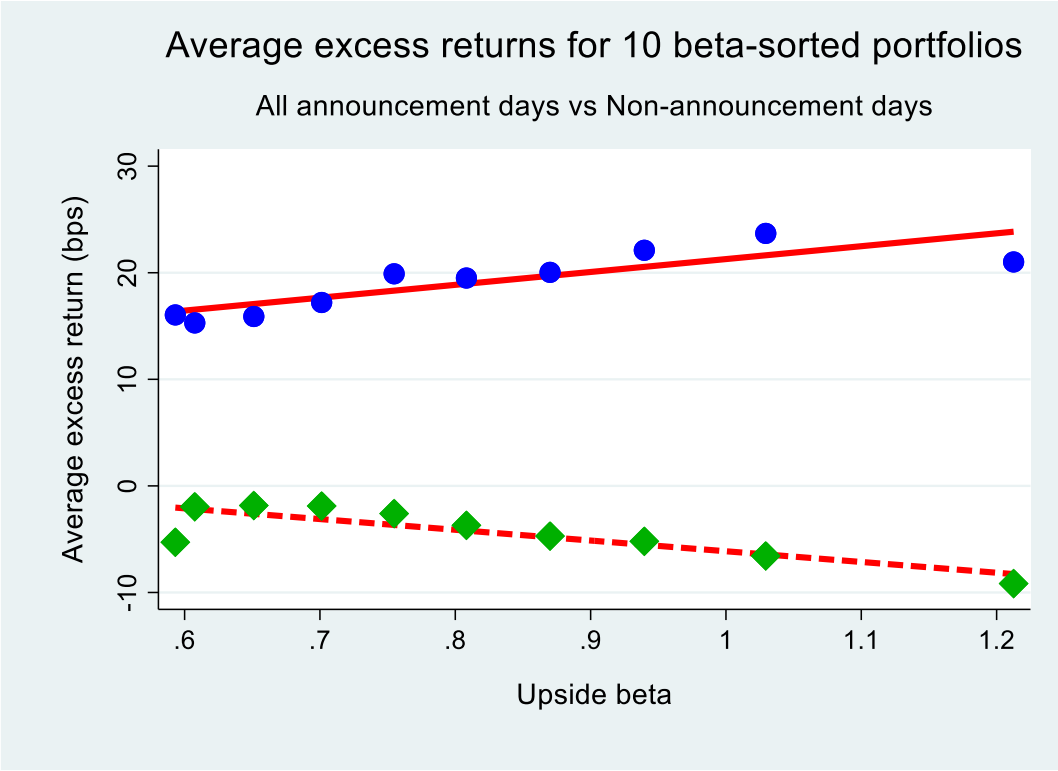

Figure 8. Average excess returns for 10 upside beta-sorted portfolios on all macroeconomic announcement days and non-announcement days

This figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is upside beta (Atilgan et al., 2018).

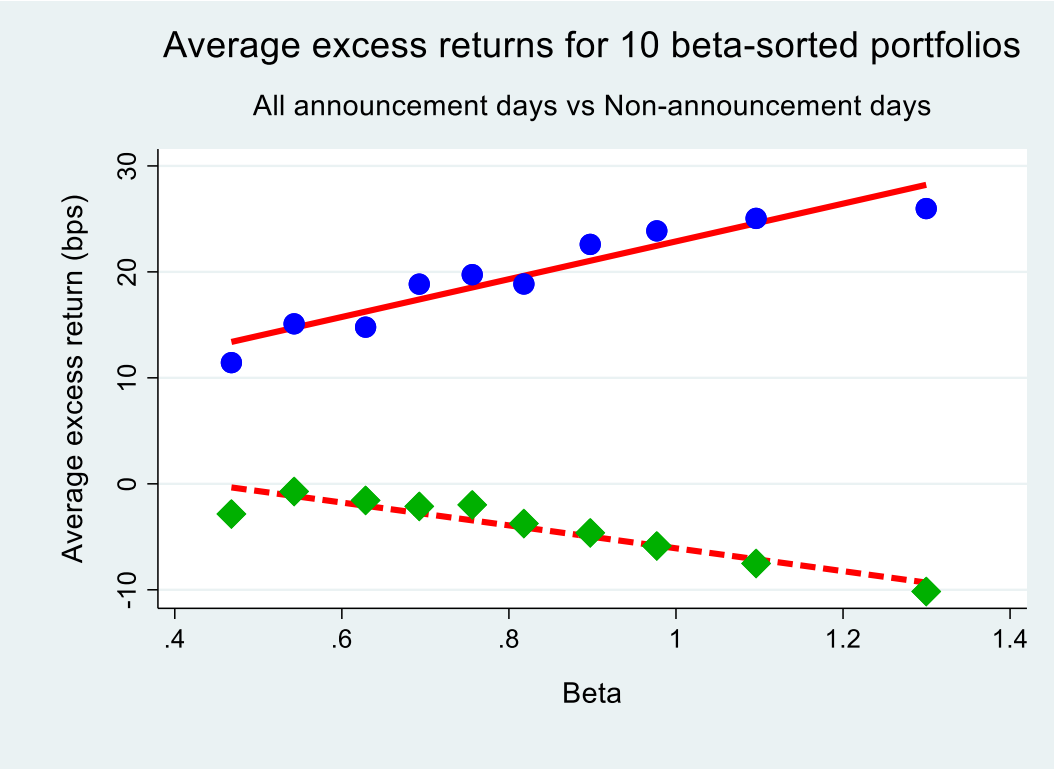

Figure 9. Average excess returns for 10 CAPM beta-sorted portfolios on all macroeconomic announcement days and non-announcement days.
This figure plots average excess returns against betas for 10 beta-sorted portfolios on macroeconomic announcement days and non-macroeconomic announcement days (all other days). The announcement days are the days when the base rate from Bank of Korea (BOK), consumer price index from Statistics Korea (CPI), and unemployment rate from Statistics Korea (EMP) are announced. The circle points indicate the average excess returns of the 10 beta-sorted portfolios on announcement days. The solid line is the regression line for the 10 circle points. The diamond signs indicate the average excess returns of the 10 beta-sorted portfolios on non-announcement days. The dashed line is the regression line for the 10 diamond points. The beta used in this figure is beta estimated by simple CAPM regression.

Table 3
Fama-MacBeth regression and pooled regression for 10 beta-sorted portfolios using (Dimson, 1979) beta on announcement days and non-announcement days

Fama-MacBeth regression				Pooled regression				
Type of day	Intercept	Beta	Adj.R^2	Intercept	Beta	Ann	Ann×Beta	Adj.R^2
A-Day	-8.63	**26.51**	28.31%	-9.14	2.82	1.22	**23.83**	0.45%
	[-1.77]	**[4.24]**		[-3.70]	[1.13]	[0.21]	**[4.07]**	
N-Day	0.69	-6.96	27.84%					
	[0.40]	[-2.67]						

This table presents the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily average excess returns for 10 beta-sorted portfolios on all macroeconomic announcement and non-announcement days, and the results of the OLS regression of daily average excess returns for 10 beta-sorted portfolios on their betas on prescheduled macroeconomic announcement days. (Dimson, 1979) betas are used for the regressions. Announcement days are the days when the inflation rate, unemployment rate, and base rate are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea. The independent variables are *Beta*, announcement dummy variables (Ann_{All}), and interaction terms between announcements and betas ($Ann_{All} \times Beta$). Ann_{All} is a dummy variable equaling 1 if a BOK or CPI or EMP announcement is released at day t+1, and 0 otherwise. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 4
Fama-MacBeth Regression and Pooled Regression for 10 Beta-Sorted Portfolios Using Various Betas

Panel A: Expected Shortfall Implied Beta (Liu, 2019)

Fama-MacBeth regression				Pooled regression				
Type of day	Intercept	Beta	Adj.R^2	Intercept	Beta	Ann	Ann×Beta	Adj.R^2
A-Day	-4.37	**24.49**	31.88%	-2.73	-1.43	-2.74	**28.11**	0.45%
	[-0.89]	**[3.72]**		[-1.11]	[-0.57]	[-0.51]	**[5.07]**	
N-Day	6.86	-11.56	32.36%					
	[4.10]	[-3.98]						

Panel B: Dynamic Conditional Beta (Engle, 2002)

Fama-MacBeth regression				Pooled regression				
Type of day	Intercept	Beta	Adj.R^2	Intercept	Beta	Ann	Ann×Beta	Adj.R^2
A-Day	-1.83	**21.28**	39.12%	-1.15	-2.79	-1.79	**26.50**	0.43%
	[-0.48]	**[3.28]**		[-0.51]	[-1.21]	[-0.36]	**[5.05]**	
N-Day	6.37	-11.23	39.52%					
	[3.95]	[-3.77]						

Panel C: Downside Beta (Atilgan et al., 2018)

Fama-MacBeth regression				Pooled regression				
Type of day	Intercept	Beta	Adj.R^2	Intercept	Beta	Ann	Ann×Beta	Adj.R^2
A-Day	-4.42	**23.24**	31.93%	-0.80	-3.40	-2.79	**28.12**	0.46%
	[-1.22]	**[5.74]**		[-0.33]	[-1.39]	[-0.52]	**[5.14]**	
N-Day	5.94	-11.76	32.65%					
	[3.75]	[-4.42]						

Panel D: Upside Beta (Atilgan et al., 2018)

Fama-MacBeth regression				Pooled regression				
Type of day	Intercept	Beta	Adj.R^2	Intercept	Beta	Ann	Ann×Beta	Adj.R^2
A-Day	2.61	**15.60**	29.25%	-0.83	-3.54	3.36	**22.21**	0.46%
	[0.54]	**[2.76]**		[-0.32]	[-1.38]	[0.59]	**[3.92]**	
N-Day	5.12	-10.54	29.09%					

	[2.53]	[-4.11]						

Panel E: Beta estimated by CAPM regression

	Fama-MacBeth regression			Pooled regression				
Type of day	Intercept	Beta	Adj.R^2	Intercept	Beta	Ann	Ann×Beta	Adj.R^2
A-Day	-0.15	**17.91**	35.60%	0.15	-4.55	0.47	**24.97**	0.46%
	[-0.04]	**[3.13]**		[0.07]	[-1.96]	[0.09]	**[4.80]**	
N-Day	5.74	-11.35	36.13%					
	[3.43]	[-4.43]						

This table presents the results of Fama-MacBeth (Fama, E. F, 1973) regressions of daily excess returns for 10 beta-sorted portfolios on all macroeconomic announcement and non-announcement days and the results of the OLS regression of daily excess returns for 10 beta-sorted portfolios on their betas on prescheduled macroeconomic announcement days. Various betas are used for the regressions. To be specific, expected shortfall beta, dynamic conditional beta, downside beta, upside beta and simple 1 year rolling beta are used in the regressions. Announcement days are the days when the inflation rate, unemployment rate, and base rate are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea. The independent variables are *Beta*, announcement dummy variables (Ann_{All}) and interaction terms between announcements and betas ($Ann_{All} \times Beta$). Ann_{All} is a dummy variable equaling 1 if a BOK, CPI, or EMP announcement is released at day t+1 and 0 otherwise. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 5
Fama-MacBeth regression of individual stock return on (Dimson, 1979) beta on macroeconomic announcement days and non-announcement days

Panel A: All macroeconomic announcement days (BOK, CPI, EMP)					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	40.41	**5.12**	-2.55	0.40	1.29%
	[3.20]	**[3.77]**	[-3.11]	[0.90]	
N-Day	-20.85	-2.22	0.39	2.15	1.24%
	[-3.41]	[-3.39]	[1.02]	[10.05]	
Panel B: BOK (Base Rate by Bank of Korea) announcement days					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	69.27	**5.05**	-4.49	0.01	1.30%
	[2.98]	**[2.32]**	[-2.92]	[0.02]	
N-Day	-16.17	-1.49	0.19	1.99	1.25%
	[-2.76]	[-2.32]	[0.52]	[9.53]	
Panel C: CPI (Consumer Price Index) announcement days					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	62.45	**6.03**	-3.97	-0.28	1.32%
	[2.98]	**[2.25]**	[-2.89]	[-0.36]	
N-Day	-16.06	-1.55	0.18	2.01	1.25%
	[-2.74]	[-2.45]	[0.49]	[9.72]	
Panel D: EMP (Unemployment Rate) announcement days					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	-10.08	**4.58**	0.92	1.49	1.23%
	[-0.47]	**[2.23]**	[0.73]	[1.90]	
N-Day	-12.38	-1.48	-0.07	1.92	1.25%
	[-2.09]	[-2.27]	[-0.19]	[9.16]	

This table presents the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily average excess returns for individual stocks on market beta and control variables on macroeconomic announcement and non-announcement days. (Dimson, 1979) betas are used for the regressions.
In Panel A, we analyze the relationship between the market beta and individual stock return considering all macroeconomic announcement days (BOK, CPI, EMP). In Panel B, we

analyze the relationship between the market beta and individual stock return considering BOK (Base Rate by Bank of Korea) announcement days. In Panel C, we analyze the relationship between the market beta and individual stock return considering CPI (Consumer Price Index) announcement days. In Panel D, we analyze the relationship between the market beta and individual stock return considering EMP (Unemployment Rate) announcement days. In detail, announcement days are the days when the inflation rate, unemployment rate, and base rate are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea. The independent variables are (Dimson, 1979) beta (*Beta*), log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 6
Fama-MacBeth regression of individual stock return on various betas on macroeconomic announcement days and non-announcement days

Panel A: Expected Shortfall Implied Beta (Liu, 2019)					
Type of day	Intercept	Beta	Size	B/M	Adj.R^2
A-Day	45.03	**3.13**	-2.69	0.31	1.14%
	[3.52]	**[3.11]**	[-3.27]	[0.68]	
N-Day	-22.01	-0.56	0.33	2.20	1.08%
	[-3.52]	[-1.64]	[0.87]	[9.88]	
Panel B: Dynamic Conditional Beta (Engle, 2002)					
Type of day	Intercept	Beta	Size	B/M	Adj.R^2
A-Day	46.44	**11.97**	-3.31	0.17	1.75%
	[3.59]	**[3.79]**	[-3.79]	[0.38]	
N-Day	-17.94	-4.69	0.44	1.98	1.76%
	[-2.99]	[-3.53]	[1.13]	[9.52]	
Panel C: Downside Beta (Atilgan et al., 2018)					
Type of day	Intercept	Beta	Size	B/M	Adj.R^2
A-Day	38.29	**11.35**	-2.90	0.47	1.57%
	[3.14]	**[3.54]**	[-3.44]	[1.05]	
N-Day	-17.55	-4.95	0.40	2.06	1.59%
	[-2.99]	[-3.83]	[1.02]	[10.07]	
Panel D: Upside Beta (Atilgan et al., 2018)					
Type of day	Intercept	Beta	Size	B/M	Adj.R^2
A-Day	49.78	**9.28**	-3.47	0.39	1.31%
	[3.68]	**[3.55]**	[-4.00]	[0.85]	
N-Day	-23.98	-3.05	0.59	2.21	1.31%
	[-3.74]	[-2.64]	[1.47]	[10.37]	
Panel E: Beta estimated by CAPM regression					
Type of day	Intercept	Beta	Size	B/M	Adj.R^2
A-Day	42.73	**15.00**	-3.43	0.54	1.81%
	[3.29]	**[3.75]**	[-3.89]	[1.22]	
N-Day	-21.09	-5.91	0.67	2.07	1.83%

[-3.40]	[-3.51]	[1.62]	[10.03]

This table presents the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily average excess returns for 10 beta-sorted portfolios on market beta and control variables on macroeconomic announcement and non-announcement days. Expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), beta estimated by CAPM regression are used as one of the market betas which is main independent variable. The control variables are log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). In addition, announcement days are the days when the inflation rate, unemployment rate, and base rate are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 7
Pooled regression of daily excess returns for individual stocks on Dimson (1979) betas on macroeconomic announcement days

	[1]	[2]	[3]	[4]	[5]
Intercept	-10.59	-9.41	-8.97	-8.51	-10.80
	[-6.42]	[-5.72]	[-5.44]	[-5.16]	[-6.55]
Beta	-1.03	-0.27	-0.40	-0.64	-1.01
	[-5.29]	[-1.45]	[-2.17]	[-3.47]	[-5.20]
Ann_{All}	**17.01**				
	[27.82]				
Ann_{BOK}		**22.69**			**23.65**
		[22.51]			**[23.44]**
Ann_{CPI}			**17.93**		**19.53**
			[17.98]		**[19.55]**
Ann_{EMP}				**7.98**	**8.93**
				[7.98]	**[8.91]**
$Ann_{All} \times Beta$	**6.21**				
	[12.33]				
$Ann_{BOK} \times Beta$		**2.25**			**2.58**
		[2.70]			**[3.09]**
$Ann_{CPI} \times Beta$			**4.54**		**5.14**
			[5.52]		**[6.25]**
$Ann_{EMP} \times Beta$				**9.70**	**10.03**
				[11.71]	**[12.10]**
Size	-0.68	-0.67	-0.69	-0.69	-0.67
	[-6.82]	[-6.68]	[-6.88]	[-6.88]	[-6.71]
B/M	2.24	2.24	2.24	2.24	2.24
	[20.94]	[20.97]	[20.92]	[20.93]	[20.97]

This table reports the results of the OLS regression of daily excess returns for individual stocks on their betas on prescheduled macroeconomic announcement days. The dependent variable is daily excess returns for individual stocks. The independent variables are *Beta*, announcement dummy variables (Ann_{All}, Ann_{BOK}, Ann_{CPI}, Ann_{EMP}), and interaction terms between announcements and betas ($Ann_{All} \times Beta$, $Ann_{BOK} \times Beta$, $Ann_{CPI} \times Beta$, $Ann_{EMP} \times Beta$). Ann_{All} is a dummy variable equaling 1 if a BOK, CPI, or EMP

announcement is released at day t+1 and 0 otherwise. Ann_{BOK} is a dummy variable equaling 1 if an announcement by the BOK is released at day t+1 and 0 otherwise. Ann_{CPI} is a dummy variable equaling 1 if a CPI announcement is released at day t+1 and 0 otherwise. Ann_{EMP} is dummy variable equaling 1 if an EMP announcement is released at day t+1 and 0 otherwise. The control variables are *Size* and *B/M*. *Size* is the log of market capitalization and *B/M* is the log of the book-to-market ratio for individual stocks. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 8
Pooled regression of daily excess returns for individual stocks on various betas on macroeconomic announcement days

	[1] **ES Implied Beta**	[2] **DCC Beta**	[3] **Downside Beta**	[4] **Upside Beta**	[5] **Beta estimated by CAPM reg.**
Intercept	-11.38	-10.24	-5.00	-11.28	-8.29
	[-6.93]	[-6.21]	[-2.90]	[-6.77]	[-4.92]
Beta	-0.43	5.19	-4.41	-1.71	-4.92
	[-3.91]	[14.41]	[-14.23]	[-4.91]	[-14.11]
Ann_{All}	**22.01**	**17.80**	**14.13**	**18.15**	**11.32**
	[45.02]	**[22.38]**	**[15.65]**	**[25.63]**	**[13.43]**
$Ann_{All} \times Beta$	**0.89**	**6.24**	**8.93**	**7.19**	**14.46**
	[3.13]	**[7.72]**	**[10.98]**	**[8.25]**	**[16.06]**
Size	-0.66	-1.17	-0.80	-0.63	-0.59
	[-6.61]	[-11.39]	[-7.90]	[-6.05]	[-5.79]
B/M	2.24	2.22	2.18	2.28	2.21
	[20.93]	[20.67]	[19.74]	[20.90]	[20.15]

This table reports the results of the OLS regression of daily excess returns for individual stocks on their betas on prescheduled macroeconomic announcement days. The dependent variable is daily excess returns for individual stocks. The independent variables are *Beta*, announcement dummy variables (Ann_{All}) and interaction terms between announcements and betas ($Ann_{All} \times Beta$). In detail, expected shortfall implied beta (Liu, 2019), dynamic conditional beta (Engle, 2002), downside beta (Atilgan et al., 2018), upside beta (Atilgan et al., 2018), beta estimated by CAPM regression are used as one of the market betas (*Beta*) which is main independent variable. Ann_{All} is a dummy variable equaling 1 if a BOK or CPI, or EMP announcement is released at day t+1 and 0 otherwise. The control variables are *Size* and *B/M*. *Size* is the log of market capitalization and *B/M* is the log of the book-to-market ratio for individual stocks. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 9
Fama-MacBeth (Fama and MacBeth, 1973) **regression for size sorted groups on macroeconomic announcement days and non-macroeconomic announcement days**

Small Size					
Panel A: Beta only					
Type of day	Intercept	Beta			Adj. R^2
A-Day	19.73	**3.04**			0.39%
	[4.24]	**[2.38]**			
N-Day	0.05	-1.40			0.43%
	[0.02]	[-2.19]			
Panel B: Beta and control variables					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	74.38	**2.66**	-5.45	-0.15	0.70%
	[2.84]	**[2.06]**	[-2.08]	[-0.23]	
N-Day	47.07	-1.29	-5.30	0.93	0.71%
	[3.82]	[-1.94]	[-4.46]	[3.14]	
Medium Size					
Panel C: Beta only					
Type of day	Intercept	Beta			Adj. R^2
A-Day	14.45	**4.61**			0.64%
	[2.96]	**[3.05]**			
N-Day	-4.81	-1.77			0.65%
	[-2.22]	[-2.51]			
Panel D: Beta and control variables					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	27.58	**5.00**	-2.05	1.56	0.86%
	[0.95]	**[3.28]**	[-0.82]	[2.43]	
N-Day	-2.65	-1.72	-1.89	2.80	0.87%
	[-0.21]	[-2.49]	[-1.82]	[8.62]	
Large Size					
Panel E: Beta only					

Type of day	Intercept	Beta			Adj. R^2
A-Day	7.58	**7.16**			1.32%
	[1.90]	**[3.28]**			
N-Day	-1.69	-2.97			1.38%
	[-0.99]	[-3.16]			
Panel F: Beta and control variables					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	46.77	**7.72**	-2.95	-0.08	2.55%
	[2.69]	**[3.57]**	[-2.63]	[-0.15]	
N-Day	-39.85	-3.05	2.04	1.87	2.61%
	[-5.23]	[-3.25]	[4.41]	[7.76]	

Table 9 presents the results from Fama-MacBeth (Fama and MacBeth, 1973) regression for size sorted groups on macroeconomic announcement days and non-macroeconomic announcement days. Announcement days are the days when the inflation rate (CPI), unemployment rate (EMP), and base rate (BOK) are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea. The independent variables are (Dimson, 1979) beta (*Beta*), log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). The dependent variable is the individual stock return. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

Table 10
Fama-MacBeth regression for groups sorted by the ratio of foreign investment on macroeconomic announcement days and non-announcement days

Group with a Low Proportion of Foreign Investment					
Panel A: Beta only					
Type of day	Intercept	Beta			Adj. R^2
A-Day	17.06	**4.35**			0.48%
	[3.89]	**[3.03]**			
N-Day	-2.35	-1.36			0.49%
	[-1.09]	[-2.08]			
Panel B: Beta and control variables					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	2.55	**4.93**	1.38	-0.09	0.72%
	[0.18]	**[2.98]**	[1.51]	[-0.13]	
N-Day	-21.22	-1.44	1.42	0.70	0.68%
	[-3.55]	[-2.00]	[3.64]	[2.51]	
Group with a Medium Proportion of Foreign Investment					
Panel C: Beta only					
Type of day	Intercept	Beta			Adj. R^2
A-Day	17.68	**3.33**			0.58%
	[3.79]	**[2.12]**			
N-Day	-3.21	-2.26			0.59%
	[-1.41]	[-3.36]			
Panel D: Beta and control variables					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	16.71	**4.57**	0.58	-0.88	0.98%
	[1.18]	**[2.62]**	[0.66]	[-1.33]	
N-Day	-28.99	-2.53	2.09	0.63	1.02%
	[-4.17]	[-3.41]	[5.04]	[2.19]	
Group with a High Proportion of Foreign Investment					
Panel E: Beta only					

Type of day	Intercept	Beta			Adj. R^2
A-Day	8.32	**6.06**			1.12%
	[2.31]	**[2.93]**			
N-Day	-0.72	-2.63			1.22%
	[-0.43]	[-2.81]			
Panel F: Beta and control variables					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	31.67	**6.22**	-1.49	-0.79	2.36%
	[2.36]	**[2.88]**	[-1.84]	[-1.55]	
N-Day	-19.70	-3.00	1.37	0.47	2.46%
	[-3.54]	[-3.00]	[4.14]	[2.15]	

This table presents the results from Fama-MacBeth (Fama, E. F, 1973) regressions of daily excess returns for individual stocks with groups sorted by three different ratios of foreign investment on their market betas and control variables on macroeconomic announcement days (BOK, CPI, EMP) and non-announcement days. Announcement days are the days when the inflation rate (CPI), unemployment rate (EMP), and base rate (BOK) are announced. The days the inflation rate and unemployment rate are released by Statistics Korea. The base rate announcement days are released by the Bank of Korea. The independent variables are (Dimson, 1979) beta (*Beta*), log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). The dependent variable is the individual stock return. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.

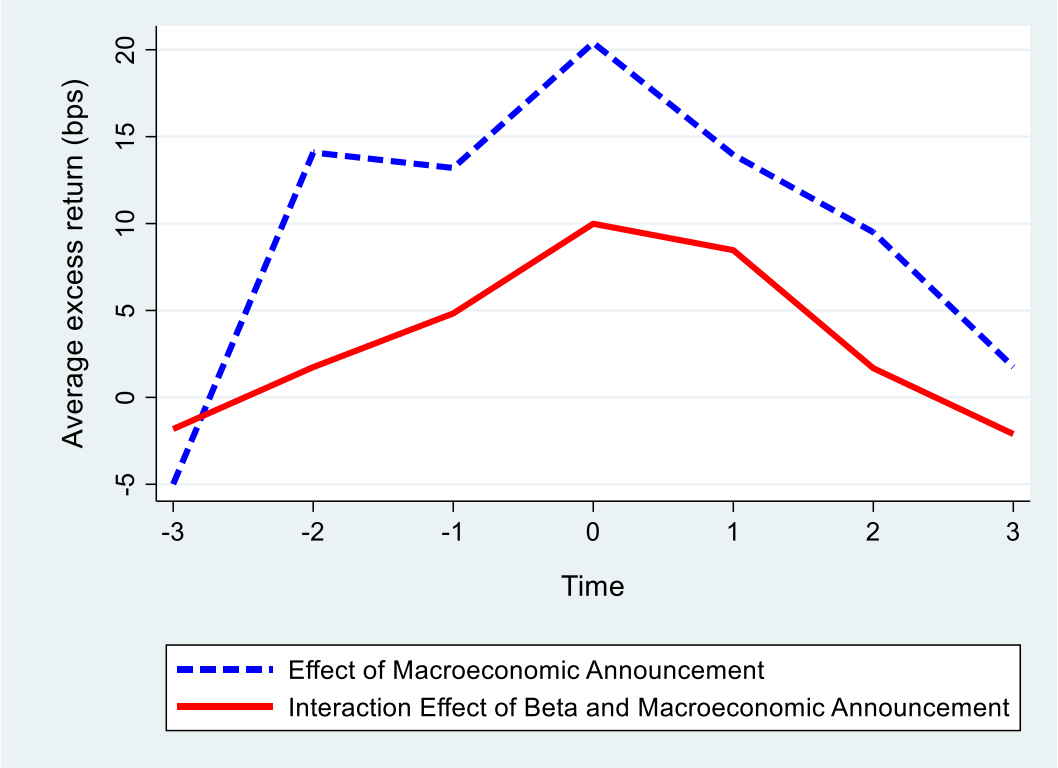

Figure 10. Average excess return of individual stocks derived from the effect of macroeconomic announcement and interaction effect of beta and macroeconomic announcement over time.

Table 11
Fama-MacBeth regression for individual stocks using Dimson (1979) beta on each macroeconomic announcement days

Panel A: GDP (Gross Domestic Product) announcement days					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	-2.99	**-2.22**	-0.59	0.68	1.06%
	[-0.10]	**[-0.72]**	[-0.29]	[0.57]	
N-Day	-12.58	-1.15	0.00	1.94	1.25%
	[-2.16]	[-1.78]	[-0.01]	[9.20]	
Panel B: BOT (Balance of Trade) announcement days					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	-27.41	**-1.40**	2.05	1.94	1.25%
	[-1.38]	**[-0.46]**	[1.50]	[2.51]	
N-Day	-11.50	-1.18	-0.13	1.90	1.25%
	[-1.96]	[-1.83]	[-0.35]	[9.16]	
Panel C: IMP (Index of Manufacturing Production) announcement days					
Type of day	Intercept	Beta	Size	B/M	Adj. R^2
A-Day	-18.53	**-0.13**	2.65	1.60	1.23%
	[-0.99]	**[-0.06]**	[2.04]	[1.95]	
N-Day	-11.95	-1.24	-0.16	1.92	1.25%
	[-2.02]	[-1.95]	[-0.43]	[9.20]	

This table presents the results of Fama-MacBeth (Fama and MacBeth, 1973) regressions of daily excess returns for individual stocks on their market betas and control variables on each macroeconomic announcement and non-announcement days. (Dimson, 1979) betas are used for the regressions. The control variables are log of market capitalization (*Size*), and log of book-to-market ratio (*B/M*). Announcement days are the days when the gross domestic product (GDP), balance of trade (BOT), and index of manufacturing production (IMP) are announced. The gross domestic production, and balance of trade announcement days are released by the Bank of Korea. The index of manufacturing production is released by Statistics Korea. All variables, including the dependent variable and independent variables, are winsorized at the 1% and 99% levels for each trading day. The null hypothesis is that the average coefficient is zero. *t*-statistics in parentheses are calculated using (Newey and West, 1987) standard errors. The coefficients are expressed in basis points. The bold numbers indicate results that are of primary interest.