

## FEMALE DIRECTORS, BLOCKHOLDERS OWNERSHIP AND CORPORATE SOCIAL RESPONSIBILITY DISCLOSURE OF LISTED NON-FINANCIAL COMPANIES IN NIGERIA

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### Abstract

*This study examines the moderating effect of block-holder ownership on the relationship between female board representation and corporate social responsibility disclosure (CSR) of listed non-financial companies in Nigeria. Using a purposive sample of 56 non-financial firms listed on the Nigerian Exchange Group between 2015 and 2022, the study adopts a CSR index based on the Global Reporting Initiative (GRI) standards and employs the Feasible Generalized Least Squares (FGLS) regression model to account for heteroskedasticity. The findings show that female directors positively impact CSR, and block-holder ownership also shows a significant positive impact on CSR. More importantly, block-holder ownership significantly moderates the relationship between female board presence and CSR, amplifying its effect. These results show the importance of inclusive governance and strategic ownership in fostering responsible business practices. The study recommends that regulators promote board gender diversity and that companies engage block-holders more effectively to enhance CSR outcomes and disclosures in the Nigerian firms.*

**Keywords:** Female Directors, Block-holders Ownership, Corporate Social Responsibility Disclosure.

### INTRODUCTION

In recent decades, Corporate Social Responsibility (CSR) has emerged as a vital dimension of corporate governance, encompassing the ethical, environmental, social, and economic obligations of companies to a broad array of stakeholders. CSR goes beyond compliance and profit-making to include voluntary actions that foster sustainable development, social equity, and environmental stewardship. In today's business landscape, firms are increasingly expected to disclose their CSR activities, demonstrating accountability not only to shareholders but also to customers, employees, communities, and regulators. The importance of CSR disclosure (CSR) is particularly pronounced in developing economies, where firms face rising pressure to align with global sustainability standards while responding to local socio-economic challenges. In Nigeria, the introduction of various governance frameworks including the Nigerian Code of Corporate Governance (2018) has signaled an institutional commitment to enhancing transparency and stakeholder trust. However, CSR practices and their disclosure levels remain inconsistent, prompting a closer examination of governance mechanisms that can promote greater corporate accountability. One such mechanism is board diversity, particularly the inclusion of female directors.

The active participation of women in both politics and business management has become a prominent focus, particularly following the Fourth World Conference on Women in Beijing,

which advocated for 30% affirmative action. European countries have taken significant steps by incorporating mandates in their regulatory frameworks and governance codes that enforce the inclusion of women in the composition of companies' boards. A similar trend is observed in Africa, where countries like Kenya and South Africa have made it compulsory for female representation on the boards of government-owned companies. Additionally, in the private sector of countries such as Kenya, Morocco, Malawi, Nigeria, and South Africa, the inclusion of women in board representation is recognized as a crucial aspect of good corporate governance (Reddy et al. 2024 and Upadhyay & Zeng, 2014). According to a survey conducted by DCSL Corporate Service Limited, spanning from 2013 to 2015 in Nigeria (2015), there has been an observed increase in the level of women representation on the boards of listed companies, with an average of 14%. A recent study conducted by the Society for Corporate Governance Nigeria (SCGN) in collaboration with the Nigerian Exchange Group (NGX) (2024) revealed that female representation on corporate boards in Nigeria experienced a 2.5% average growth over the past four years. The study indicated an approximate 2.5 percentage increase in female representation on the boards of the top 100 companies listed on the NGX from 2020 to 2023.

Females are often perceived as more socialized and possess a heightened concern for the needs of others, along with a closer affinity for social responsibility (Mcguinness, Vieito & Wang, 2016). Katnon et al. (2017) suggest that boards with females' representation excel in monitoring and contribute to the quality of disclosure through effective supervision of general reporting. However, the literature on the impact of female directors on CSRD presents mixed findings. Some studies, such as Walls, Berrone, and Phan (2012), Boulouta (2013), Yasser et al. (2017), Gulzar et al. (2019), Uyar et al. (2020), Alia and Mardawi (2021), Alkayed and Omar (2022), and Ma and Chen (2023), document a significant positive impact of female directors on CSR. Conversely, studies by Yang, Yang and Gao (2019), Zaid et al. (2020), Rashid and Hossain (2021), and Alkayed and Omar (2022) find an insignificant impact of female directors on CSRD practices.

This divergence suggests that contextual variables may play a significant role in shaping the impact of board gender diversity on CSR. One such contextual factor is block-holder ownership, which refers to the presence of large shareholders who possess substantial influence over managerial decisions. While block-holders can serve as effective monitors, their influence may either facilitate or constrain the efforts of female directors to promote CSR, depending on their orientation toward long-term social value versus short-term financial gains.

Non-financial companies in Nigeria refer to incorporated entities that primarily engage in the production of goods and services for the market. These companies span various industries, including food, water, quarries, road constructions, cement manufacturing, beverages and breweries, pharmaceuticals, oil prospecting, petrochemicals, steel production, paper and textile manufacturing, agriculture, and a range of non-financial services. They are concentrated in industrial hubs such as Enugu, Onitsha, and Aba in the South East; Lagos and Ibadan in the South West; Port Harcourt and Warri in the South-South; Kano and Kaduna in the North-West; Bauchi and Maiduguri in the North East; and Jos and Ilorin in North Central. The operations of these companies have significant implications for society and the environment, prompting a growing recognition of the need for stakeholder involvement in corporate environmental operations and CSR initiatives and their practice.

This study seeks to explore how block-holder ownership moderates the relationship between female directors and corporate social responsibility disclosure (CSRD) among listed non-

financial companies in Nigeria. Through this investigation, the research adds to the existing body of knowledge on corporate governance and CSR within emerging markets, offering valuable insights that can inform the development of more effective governance policies by regulators, policymakers, and investors.

The remaining part of the paper is structured as: literature review, methodology, result and discussion then the conclusions and recommendations.

## LITERATURE REVIEW

The recommendation for a gender-sensitive board is rooted in it is potential to alleviate agency costs, with the perception that female directors tend to be more generous, while their male counterparts are more autonomous, thereby addressing agency problems (Yarosan & Giwa, 2016). Bernardi and Threadgill (2010) emphasizes that companies with women on boards exhibit a more innovative and CSR-oriented approach compared to those with male-dominated boards, helping to mitigate conflicts of interest. Bear, Rahman, and Post (2010) suggest that women's affinity for CSR may stem from their values, moral orientation, and ethical judgment, with females generally showing a greater regard for the needs of others and a heightened sensitivity to unethical behaviors (Boulouta, 2013). Galbreath (2011) contends that men on boards may view women as more inclined toward activities involving customer service, human resources, and charitable giving, which can positively impact environmental quality and enhance CSR engagements and disclosure.

A substantial body of empirical evidence presents varied perspectives on the relationship between the involvements of female directors on corporate boards and CSRD. Some studies suggest a significant positive relationship, while others report a significant negative relationship, and some fail to establish any clear association. For instance, Javeed et al. (2022) found that female directors have a significant positive impact on CSRD, and similar findings were observed by Zhang, Marquis and Qiao (2016), Boulouta (2013), Shaukat, Qiu and Trojanowski (2015), McGuinness et al. (2016), Sundarasan et al. (2016), Lone, Ali, and Khan (2016), Yarosan and Giwa (2016), Yasser et al. (2017), Welbeck (2017), Buerthey (2020), Shaheen et al. (2021) and Wang et al. (2021).

On the contrary, Walls et al. (2012), Ballesteros et al. (2015), Cucari et al. (2017), Halimah and Rahmawati (2019), Martinez and Alvarez (2021), Jeong, Kim and Arthurs (2021) and Ma and Chen (2023) discovered a significant negative impact of female directors on CSRD. Meanwhile, Post et al. (2011), Giannarakis et al. (2014), Li et al. (2016), Katmon et al. (2017), Harjoto and Rossi (2019), Tran et al. (2020), Taufik (2021) and Alkayed and Omar (2022) found that the presence of female directors had an insignificant impact on CSRD.

The inconsistency in results highlights the complexity of the relationship between female representation on boards and CSRD outcomes. Empirical research in this domain has yielded mixed findings, with some studies indicating a positive association between gender-diverse boards and CSRD, while others suggest limited or no discernible impact. This variability emphasizes the need for further research to gain a more nuanced understanding of the nuanced dynamics at play.

Hence, the introduction of block-holder ownership is proposed as a moderating factor in this relationship. If block-holders are investors with a strong commitment to social responsibility, prioritizing CSRD and sustainability, the presence of women on the board might enhance the

positive correlation with CSR. Female directors are anticipated to resonate with the values of socially responsible block-holders, contributing to more effective CSR decision-making. The dynamic between female representation on boards and CSRD outcomes is intricately linked to the interplay of managerial ownership and block-holder ownership. The moderating effects are contingent upon factors such as the alignment of interests between managers and shareholders, the values and preferences of block-holders, and the overall corporate culture's dedication to CSRD.

Consequently, there is a need for empirical research to shed light on how companies can strategically optimize the collaboration between female directors and block-holders to foster responsible and sustainable CSRD practices.

## METHODOLOGY

The population of this study comprised all listed non-financial companies on the Nigerian Exchange Group for the period of 2015 to 2022. There were 114 non-financial companies listed as at 31 December, 2022 on the Nigerian Exchange Group. The study employs a purposive sampling technique to identify companies suitable for inclusion in the research. This involves applying a two-point filter to select the sample, firstly, selected firms had to be listed throughout the entire research period spanning from 2015 to 2022. Secondly, the chosen companies were required to have a complete set of financial statements for the specified study period.

The first criterion ensured the comprehensive observation of a company's disclosure behavior over the entire study period, facilitating a thorough examination. This approach was essential for conducting a panel study. 24 companies were removed on the basis of the first criteria. The second criterion aimed to avoid redundancy in the sample, enhancing the relevance and efficiency of the selected companies. 34 companies were removed on the basis of second criteria. Accordingly, 56 companies were used as the sample size.

The dependent variable is CSRD, for the purpose of this study CSRD is measured by CSRD index using content analysis with a checklist of 24 items from the 2016 Global Reporting Initiative (GRI) disclosure requirements. The study developed a five-point scale measurement to evaluate the quality of disclosure. This approach aims to overcome the common omission of pictures, graphs, and charts in existing methodologies by adapting [Alkayed and Omar \(2022\)](#) and [Freedman and Stagliano \(2008\)](#) measurement of CSR quality of disclosure. This new five-point scale distinguished between poor and excellent disclosures. A score of 0 indicates no disclosures, 1 and 2 are for non-GRI compliance disclosures (1 for general disclosure and 2 for items with disclosure accompanied by pictures, graphs or charts), and 3 and 4 are for GRI compliance (3 for partial GRI compliance and 4 for full GRI compliance).

While the independent variable female directors in the board are proxies by numbers of female directors in the respective companies. The moderating variable is block-holders ownership proxied by proportion of shares held by significant shareholders (that is, shareholdings of 5 percent or more). Control variables are: profitability (ROE that is earnings divided by equity), firm size (natural log of total asset) and firm age (number of years of incorporation)

Below are the general models guiding the research which is adapted from [Alkayed and Omar \(2022\)](#) and [Haniffa and Cooke, \(2005\)](#). Model 1 explains the direct impact of the independent variables on the dependent variable. Model 2 examines the direct impact of both the independent and moderating variables on the dependent variable. Model 3 captures the

interaction effect of the moderating variable on the relationship between the independent and dependent variables.

Model 1

$$CSR_{Dit} = \beta_0 + \beta_1 FD_{it} + \beta_2 PT_{it} + \beta_3 FS_{it} + \beta_4 FA_{it} + \varepsilon_{it} \quad (1)$$

Model 2

$$CSR_{Dit} = \beta_0 + \beta_1 FD_{it} + \beta_2 BO_{it} + \beta_3 PT_{it} + \beta_4 FS_{it} + \beta_5 FA_{it} + \varepsilon_{it} \quad (2)$$

Model 3

$$CSR_{Dit} = \beta_0 + \beta_1 FD_{it} + \beta_2 BO_{it} + \beta_3 BO * FD_{it} + \beta_4 PT_{it} + \beta_5 FS_{it} + \beta_6 FA_{it} + \varepsilon_{it} \quad (3)$$

Where  $\beta_0$  = is constant for all entities in the time period

$CSR_{Dit}$  = Corporate Social Responsibility Disclosure Index for all entities over the time period,

$FD_{it}$  = Represent the female directors for all Entities over the Time period,

$BO_{it}$  = Represent Blockholders Ownership for all Entities over the Time period,

$PT_{it}$  = Profitability for all Entities over the Time period,

$FS_{it}$  = Represent Firm Size for every Entity over the Time period,

$FA_{it}$  = Represent Firm age for every Entity over the Time period,

$BO * FD$  = Interaction between Block-holders ownership and female director's variable,

$\varepsilon_{it}$  = Error Term for all Companies over time period,

$\beta_1 - \beta_{13}$  = partial derivatives or the gradient of the independent variable,

$i$  = Firm,

and  $t$  = time.

## RESULTS AND DISCUSSION

Table I displays the results of the regression analysis conducted on the study's variables. Following tests for group-wise heteroskedasticity and contemporaneous independence, evidence of heteroskedasticity was identified within the models utilized in the study (see Appendix). As a result, the Feasible Generalized Least Squares (FGLS) regression approach was deemed appropriate. The rationale for adopting the FGLS model lies in the fact that the estimations derived from the Fixed Effects (FE) and Random Effects (RE) models are likely to be biased due to the presence of heteroskedasticity (refer to Appendix). Therefore, the FGLS technique is employed to generate more reliable and accurate parameter estimates, as it effectively addresses heteroskedasticity issues (Drukker, 2008). Hence, the application of the FGLS model was found to be necessary for this study.

**Table I: FGLS Regression Result**

|          | MODEL 1 |           | MODEL 2 |           | MODEL 3 |          |
|----------|---------|-----------|---------|-----------|---------|----------|
| CSRINDEX | Coef.   | P>z       | Coef.   | P>z       | Coef.   | P>z      |
| FD       | 0.0449  | 0.000***  | 0.02597 | 0.017**   | -0.113  | 0.000*** |
| BO       |         |           | 0.05998 | 0.001***  | 0.054   | 0.017**  |
| BOFD     |         |           |         |           | 0.543   | 0.000*** |
| ROE      | 0.0012  | 0.2480    | 0.0027  | 0.016**   | 0.003   | 0.010**  |
| FA       | 0.0009  | 0.1290    | 0.00233 | 0.000***  | 0.002   | 0.001*** |
| FS       | 0.0629  | 0.001***  | 0.01936 | 0.403     | 0.022   | 0.308    |
| CONS     | -0.1287 | 0.4960    | -0.4174 | 0.041     | -0.468  | 0.036    |
| Wald     | chi2(9) | 93.22     |         | 89.62     |         | 161.04   |
| Prob     | > chi2  | 0.0000*** |         | 0.0000*** |         | 0.000*** |

Source: Generated by the author from annual report data of companies using STATA

Table 1 presents the FGLS regression results for Models 1, 2, and 3, which assess the impact of the independent variable—female directors, the moderating variable—block-holder ownership, as well as control variables such as return on equity, firm age, and firm size (measured by the logarithm of total sales) on the corporate social responsibility disclosure (CSR) of listed non-financial firms in Nigeria. The table also explores the moderating effect of block-holder ownership on the relationship between FD and CSR. The results reveal that all three models are statistically significant, with coefficients of 93.22, 89.62, and 161.04, and p-values of 0.000. This indicates that the FGLS estimation yields robust and reliable parameter estimates, significant at the 1% level, thereby enhancing the precision of the study's findings.

Table 1 demonstrates a significant positive impact of female directors on CSR within listed non-financial companies in Nigeria, with a coefficient of 0.0449 at a 1% significance level and coefficient of 0.02597 at a 5% significance level for model 1 and 2 respectively. For every 1 unit increase in the number of FD will lead to 0.0449 and 0.02597 increases in CSR for the two models. This indicates that a higher representation of female directors on the board positively influences CSR practices and disclosures to stakeholders. This finding shows the importance of diversity and gender inclusion in corporate governance structures, suggesting that companies with more balanced gender representation on their boards are more likely to prioritize CSR initiatives and effectively communicate them to stakeholders. This finding aligns with the outcomes of various studies by McGuinness et al. (2016), Yasser et al. (2017), Welbeck (2017), Gulzar et al. (2019), Nour et al. (2020), Aladwey et al. (2021), Wang et al. (2021), Khidmat et al. (2021), and Seckin-Halac et al. (2021) all of which reported a significant positive impact of female directors on CSR. However, this study's results contradict other research, such as that of Cucari et al. (2017), Ananzeh (2021), Jeong et al. (2021), Javeed et al. (2022), and Ma & Chen (2023) which found a significant negative impact of female directors on CSR. Therefore, the result aligns with stakeholder theory, which suggests a diverse board, including gender diversity, can better represent the interests of various stakeholders, thereby positively influencing CSR initiatives and disclosure (Donaldson & Preston, 1995). Legitimacy theory aligns with this as well, proposing that firms engage in CSR activities and disclosure to legitimize their operations and the positive impact of female directors may contribute to enhancing the perceived legitimacy of CSR practices and disclosure (Suchman, 1995). In terms of agency theory, a positive relationship between female directors and CSR could be seen as a governance mechanism aligning diverse stakeholder interests with those of the firm and

reducing agency conflicts (Jensen & Meckling, 1976).

The direct influence of the moderating variable, block-holders ownership, on CSRD is positive (coefficient of 0.05998) at a 5% significance level as presented in Table 1, indicating a significant positive impact on the CSRD of the selected firms. A 1-unit increase in block-holders ownership leads to a 0.05998 increase in CSRD. The finding implies that block-holders' owners may align shareholder interests more closely with CSR objectives, as block-holders may have a long-term stake in the company's performance and reputation. Furthermore, the positive association between block-holders ownership and CSRD implies that investors with significant ownership stakes may prioritize CSR practices and disclosure as a means of enhancing long-term value creation. This discovery aligns with previous research by Garcia-Meca & Pucheta-Martínez (2017), Mascena et al. (2020), Javeed et al. (2022), and Alkayed and Omar (2022) which collectively establishes a positive relationship between block-holders ownership and CSRD. Conversely, it diverges from the findings of Ali and Atan (2013), Li et al. (2016), Al-Saidi (2020), Ananzeh (2021), Seckin-Halac et al. (2021), Alia and Mardawi (2021), Chen et al. (2021), and Ananzeh et al. (2023) where a negative impact of block-holders ownership on CSRD was identified.

The results in Table 1 indicate a positive and significant moderating effect of block-holders' ownership on the impact of female directors on CSRD, with a coefficient of 0.543 at the 1 percent level of significance. This aligns with the findings of the direct relationship, which also demonstrates a positive and significant impact. These results imply that a higher representation of females on the board, particularly when in conjunction with higher block-holders' ownership, significantly enhances a company's engagement in CSR practices and disclosure. This suggests a synergistic effect when both factors are present. This aligns with stakeholder theory's expectation that a diverse and inclusive board can contribute to a broader consideration of societal and ethical concerns in corporate governance. The results suggest that having more female directors on the board, particularly in companies with higher block-holder ownership, positively contributes to CSR initiatives and disclosure. Stakeholder theory posits that diverse voices in decision-making, such as those represented by female directors, can better capture and consider the interests of various stakeholders beyond just shareholders. In this context, the positive and significant impact on CSR engagement and disclosure indicates that the combined influence of female directors and block-holders may lead to more comprehensive and socially responsible decision-making.

Table 1 also highlights the effects of the control variables—profitability (PT), represented by Return on Equity, firm age, and firm size on CSRD. The findings show that both ROE and firm age have a positive and statistically significant impact on CSRD. This suggests that as ROE increases, firms tend to be more engaged in CSR initiatives and are more transparent in their disclosures. The positive association indicates that financially successful companies are more inclined to commit to CSR efforts. Likewise, the significance of firm age implies that older firms are more likely to influence and enhance CSR practices and disclosure, emphasizing the role of organizational maturity in promoting responsible business behavior.

## CONCLUSIONS AND RECOMMENDATIONS

This study concludes that both female board representation and block-holder ownership play significant and positive roles in enhancing corporate social responsibility disclosure among listed non-financial companies in Nigeria. The findings reveal that female directors contribute meaningfully to CSR practices and transparency, emphasizing the value of gender diversity in

corporate governance. Likewise, block-holder ownership positively influences CSRD, likely due to block-holders' long-term interest in firm reputation and performance. The interaction between female directors and block-holder ownership further strengthens CSR engagement and disclosure, suggesting a synergistic effect that enhances socially responsible decision-making. These outcomes support the theoretical underpinnings of stakeholder, legitimacy, and agency theories, indicating that inclusive governance and strategic ownership structures are critical drivers of effective CSR in emerging markets.

Based on the study's findings, it is recommended that regulatory bodies such as the Financial Reporting Council of Nigeria and the Securities and Exchange Commission actively promote gender diversity on corporate boards. This can be achieved by formulating and enforcing policies that mandate or incentivize increased female representation in boardrooms. The study has shown that female directors significantly contribute to CSRD, suggesting that a more gender-balanced board leads to enhanced CSR practices and transparency. Therefore, fostering inclusive governance through gender diversity is essential for improving the quality and credibility of CSR disclosures in Nigerian listed firms.

Furthermore, companies should acknowledge the critical role of block-holders in advancing CSR objectives. Institutional investors and significant shareholders should be encouraged to participate more actively in corporate governance, particularly in areas related to sustainability, ethics, and long-term value creation. Given that block-holders often have a long-term interest in the firm's performance and reputation, their involvement can serve as a strong motivator for the adoption and disclosure of socially responsible practices. Promoting responsible block-holder engagement can thus help align corporate objectives with broader stakeholder expectations, leading to more robust and transparent CSR outcomes.

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## APPENDIX

### MODEL 1

#### Random Effect

```
xtreg csrindex fd roe fa fs, re
Random-effects GLS regression
Group variable: coy

R-sq:
    within = 0.0110
    between = 0.1240
    overall = 0.0843

Number of obs   =      448
Number of groups =       56

Obs per group:
    min =      8
    avg =     8.0
    max =      8

Wald chi2(8) =     14.17
Prob > chi2   =     0.0776

corr(u_i, X) = 0 (assumed)

-----+-----
      csrindex |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----+-----
           fd |   .0073128   .0107114     0.68   0.495   - .0136811   .0283066
          roe |  -.0010058   .0012992    -0.77   0.439   - .0035522   .0015406
           fa |   .0019523   .0011695     1.67   0.095   - .0003399   .0042446
           fs |   .0861313   .0305423     2.82   0.005   .0262695   .1459931
          _cons |  -.4810482   .3019797    -1.59   0.111   -1.072917   .110821
-----+-----
      sigma_u |   .15340902
      sigma_e |   .16099132
          rho |   .47589732   (fraction of variance due to u_i)
-----+-----

. estimate store random
```

#### Fixed Effect

```
. xtreg csrindex fd roe fa fs, fe

Fixed-effects (within) regression
Group variable: coy

R-sq:
    within = 0.0366
    between = 0.0003
    overall = 0.0011

Number of obs   =      448
Number of groups =       56

Obs per group:
    min =      8
    avg =     8.0
    max =      8

F(8,384) =      1.82
Prob > F   =     0.0710

corr(u_i, Xb) = -0.6177

-----+-----
      csrindex |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
           fd |  -.0054682   .0114027    -0.48   0.632   - .0278877   .0169513
          roe |  -.0023071   .0015173    -1.52   0.129   - .0052903   .0006761
           fa |   .0092299   .0044891     2.06   0.040   .0004037   .0180562
           fs |  -.0196959   .0558894    -0.35   0.725   - .1295835   .0901917
          _cons |   .2644452   .5306542     0.50   0.619   - .7789065   1.307797
-----+-----
      sigma_u |   .26950029
      sigma_e |   .16099132
          rho |   .73700081   (fraction of variance due to u_i)
-----+-----

F test that all u_i=0: F(55, 384) = 10.29          Prob > F = 0.0000

. estimate store fixed
```

## Hausman test

. hausman fixed random

| ---- Coefficients ---- |           |           |            |                                 |
|------------------------|-----------|-----------|------------|---------------------------------|
|                        | (b)       | (B)       | (b-B)      | $\sqrt{\text{diag}(V_b - V_B)}$ |
|                        | fixed     | random    | Difference | S.E.                            |
| fd                     | -.0054682 | .0073128  | -.012781   | .00391                          |
| roe                    | -.0023071 | -.0010058 | -.0013014  | .0007837                        |
| fa                     | .0092299  | .0019523  | .0072776   | .0043341                        |
| fs                     | -.0196959 | .0861313  | -.1058272  | .0468059                        |

b = consistent under Ho and Ha; obtained from xtreg  
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$\chi^2(8) = (b-B)'[(V_b - V_B)^{-1}](b-B)$   
= 45.02  
Prob>chi2 = 0.0000  
(V<sub>b</sub>-V<sub>B</sub> is not positive definite)

## Feasible Generalize Least Square (FGLS)

. xtglm csrindex fd roe fa fs

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares  
Panels: homoskedastic  
Correlation: no autocorrelation

|                            |   |          |                  |   |        |
|----------------------------|---|----------|------------------|---|--------|
| Estimated covariances      | = | 1        | Number of obs    | = | 448    |
| Estimated autocorrelations | = | 0        | Number of groups | = | 56     |
| Estimated coefficients     | = | 9        | Time periods     | = | 8      |
|                            |   |          | Wald $\chi^2(8)$ | = | 93.22  |
| Log likelihood             | = | 14.14305 | Prob > $\chi^2$  | = | 0.0000 |

| csrindex | Coef.     | Std. Err. | z     | P> z  | [95% Conf. Interval] |
|----------|-----------|-----------|-------|-------|----------------------|
| fd       | .044884   | .0106656  | 4.21  | 0.000 | .0239799 .0657882    |
| roe      | .0011818  | .001022   | 1.16  | 0.248 | -.0008214 .003185    |
| fa       | .000914   | .0006021  | 1.52  | 0.129 | -.0002662 .0020942   |
| fs       | .0629071  | .0195565  | 3.22  | 0.001 | .0245771 .1012372    |
| _cons    | -.1287144 | .18928    | -0.68 | 0.496 | -.4996964 .2422677   |

## Contemporaneous Correlation

. xtcsd, pesaran abs

Pesaran's test of cross sectional independence = 4.086, Pr = 0.1000

Average absolute value of the off-diagonal elements = 0.443

## Group wise heteroskedasticity

. xttest3

Modified Wald test for groupwise heteroskedasticity  
in fixed effect regression model

H0:  $\sigma(i)^2 = \sigma^2$  for all i

$\chi^2(56) = 2.3e+05$   
Prob> $\chi^2 = 0.0000$

## MODEL 2

### Feasible Generalize Least Square (FGLS)

```
. xtglm csrindex fd bo roe fa fs
```

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares  
Panels: homoskedastic  
Correlation: no autocorrelation

|                            |   |           |                  |   |        |
|----------------------------|---|-----------|------------------|---|--------|
| Estimated covariances      | = | 1         | Number of obs    | = | 448    |
| Estimated autocorrelations | = | 0         | Number of groups | = | 56     |
| Estimated coefficients     | = | 10        | Time periods     | = | 8      |
|                            |   |           | Wald chi2(9)     | = | 89.62  |
| Log likelihood             | = | -4.123482 | Prob > chi2      | = | 0.0000 |

| csrindex | Coef.     | Std. Err. | z     | P> z  | [95% Conf. Interval] |           |
|----------|-----------|-----------|-------|-------|----------------------|-----------|
| fd       | .0259713  | .0108699  | 2.39  | 0.017 | .0046666             | .0472759  |
| bo       | .0599759  | .0187453  | 3.20  | 0.001 | .0232359             | .096716   |
| roe      | .0026971  | .0011204  | 2.41  | 0.016 | .0005013             | .004893   |
| fa       | .0023349  | .0006391  | 3.65  | 0.000 | .0010822             | .0035875  |
| fs       | .0193604  | .0231404  | 0.84  | 0.403 | -.0259939            | .0647147  |
| _cons    | -.4173715 | .2046817  | -2.04 | 0.041 | -.8185402            | -.0162028 |

## MODEL 3

### Feasible Generalize Least Square (FGLS)

```
. xtglm csrindex fd bo fdbo roe fa fs
```

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares  
Panels: homoskedastic  
Correlation: no autocorrelation

|                            |   |          |                  |   |        |
|----------------------------|---|----------|------------------|---|--------|
| Estimated covariances      | = | 1        | Number of obs    | = | 448    |
| Estimated autocorrelations | = | 0        | Number of groups | = | 56     |
| Estimated coefficients     | = | 15       | Time periods     | = | 8      |
|                            |   |          | Wald chi2(14)    | = | 161.04 |
| Log likelihood             | = | 23.81707 | Prob > chi2      | = | 0.0000 |

| csrindex | Coef.     | Std. Err. | z     | P> z  | [95% Conf. Interval] |           |
|----------|-----------|-----------|-------|-------|----------------------|-----------|
| fd       | -.1126162 | .0286748  | -3.93 | 0.000 | -.1688177            | -.0564146 |
| bo       | .0537589  | .0224995  | 2.39  | 0.017 | .0096608             | .097857   |
| fdbo     | .5425901  | .0945837  | 5.74  | 0.000 | .3572095             | .7279707  |
| roe      | .0027134  | .0010592  | 2.56  | 0.010 | .0006374             | .0047895  |
| fa       | .0021219  | .0006147  | 3.45  | 0.001 | .000917              | .0033267  |
| fs       | .0224565  | .022007   | 1.02  | 0.308 | -.0206766            | .0655895  |
| _cons    | -.4683866 | .2229444  | -2.10 | 0.036 | -.9053495            | -.0314237 |