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Stock Price Comovement of ADRs

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We study stock price comovement of ADRs and find stock prices of ADRs comove more with the U.S. market than do stock prices of U.S. firms. This finding sounds puzzling. ADRs are foreign firms and their stock prices are expected to have a lower correlation with the U.S. market than stock prices of U.S. firms. Our explanation is that stock prices of ADRs are not very efficient and a lot of firm specific information is not captured by stock prices. Thus stock prices seem to comove more with the U.S. stock market. Consistent to this explanation, we find that analyst coverage reduces stock price comovement for ADRs while it increases stock price comovement for U.S. firms, implying that analysts process relatively more market-level information for U.S. firms and more firm-specific information for ADRs. This result supports our hypothesis that there is a lot of firm specific information about ADRs for analysts to process.

JEL Codes: G14, G29

Field: Finance

1. Introduction

Some stocks' prices comove more with the market and others' comove less. Stock price comovement can be driven by market-level information, industry-wide information, and firm-specific information. To measure stock price comovement, literature uses R-squared of the market regression, which is the percentage of market-level volatility in the total volatility of stock prices. The level of R-squared depends on the relative amount of market-level information against total information incorporated into stock prices. If a firm's stock prices incorporate relatively more market-level information than average firms', they tend to commove more with the market. In this paper, we study stock price comovement of non-U.S. stocks that trade in the U.S. markets. We investigate how market-level information and firm-specific information are incorporated differently in the stock prices of non-U.S. firms, compared to their U.S. peers that trade in the same markets.

Morck, Yeung, and Yu (2000) study stock price comovement in emerging markets and document cross-country differences that stock prices move together less in economies with higher per capita GDP than in economies with lower per capita GDP. Economies with higher per capita GDP tend to have better property rights protections and better investor protections, which they think contribute to information transparency and therefore low comovement. However, they did not address the fact that information transparency includes both market-level information transparency and firm-specific information transparency. Their research assumes that stock price variations driven by market-level information do not vary

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much across firms and across countries. Chan and Hameed (2006) find that information production activities by analysts increase stock price comovement in emerging markets. Their results indicate market level information transparency could also affect stock price comovement.

Different from Morck, Yeung, and Yu (2000) and Chan and Hameed (2006), we do not investigate price comovement in international markets. Instead, to investigate how different types of information affect stock price comovement, we study non-U.S. firms in the setting that both non-U.S. stocks and U.S. stocks trade together. American Depositary Receipts (abbreviated as ADRs) represent ownership in the shares of a non-U.S. company that trades in U.S. financial markets. ADRs' stock price comovement depends on the relative amount of market-level information against firm-specific information incorporated in stock prices. By construction, market-level information refers to information of the U.S. market movement incorporated in stock prices. The portion of ADRs' home country information that is not correlated with the U.S. capital markets is captured by firm-level variation. Because ADRs are foreign firms and their fundamentals are influenced more by local markets than by the U.S. market, the proportion of stock movement that could be explained by the movement of the U.S. markets is low. Therefore we hypothesize that ADRs have lower stock price comovement with the U.S. markets than U.S. stocks if stock prices of ADRs are informative (Hypothesis One). However, we find the opposite. The returns of ADRs comove more with the U.S. markest than comparable U.S. firms do.

When the stock market is efficient, ADR's price includes U.S. market information, industry information, firm level information, and local stock market information. Otherwise, stock prices of ADRs are not informative and they do not capture enough firm specific information and local stock market information of ADRs. That could be the reason why we find higher stock price comovement of ADRs. Previous research has documented that analyst forecasts improve information efficiency in stock. Security analysts will be able to use home country information and firm specific information, which is costly to capture and process for average investors, to forecast ADR's earnings and operations. Therefore we anticipate analyst coverage of ADRs will reduce stock price comovement for ADRs because information production by analysts will help firm-specific information, including their home country information, incorporated into stock prices for ADRs (Hypothesis Two). We find that analyst coverage of ADRs does reduce stock price comovment while analyst coverage of U.S. firms increases stock price comovement. This result implies that analysts produced relatively more firm specific information for ADRs and more market level information for U.S. firms.

The major contribution of this paper is being the first to document differences in stock price comovement between U.S. firms and ADRs, both of which are listed in the U.S. stock exchanges. This is also the first paper that shows analyst coverage has negative impact on stock price comovment of ADRs while has positive impact on stock price comovement of U.S firms. The result is different from Chan and Hameed (2006)'s which indicate analyst coverage increases price comovement of stocks at emerging markets. In addition, we provide explanations to the documented differences, which are consistent to current literature about the impact of information asymmetry on stock price comovement.

In the next section, we review related literature and provide support to our hypotheses. Section 3 is about data and research design. In Section 4 we report the empirical results and discuss their implications. Section 5 includes conclusions of this study and suggestions of potential future research.

2. Literature Review

2.1 Cross-country and Cross-sectional Difference in Stock Price Comovement

Roll (1988) empirically investigates how much of the stock return variation is explained by systematic factors, industry factors, and firm-specific events. Low R-squared of the market model is documented in the U.S. stock market and neither firm size nor industry influences could explain the low R-squared. After Roll (1988), literature has documented cross-country and cross-sectional differences in stock price comovement and has provided explanations to these differences. An American depositary receipt (ADR) is a negotiable security that represents the underlying securities of a non-US company that trades in the US financial markets. Given the fact that there are cross-country differences in return synchronicity, it is interesting to study whether there is difference in return synchronicity (interchangeable with stock price comovement) between U.S. firms and non-U.S. firms when both of them trade in the U.S. stock markets.

2.2 Information Explanation

Morch, Yeung, and Yu (2000) find that stock prices move in a more synchronous way in poor economies than in rich economies. They further find that both property rights protections and investor protections explain the cross-country difference in stock price comovement. Jin and Myers (2006) provide theoretical analysis and empirically find that both information opaqueness and control rights are positively related to R-squared of the market model, because information opaqueness shifts firm-specific risk to managers and thus investors bear relatively more market risk. Durnev, Morch, Yeung, and Zarowin (2003) provide direct evidence that stocks with lower market model R-squared have more informed prices. They find that the market model R-squared is negatively related to the association between current returns and future earnings. In other words, stock returns that better predict future earnings tend to have lower synchronicity/comovement. Their study implies that return synchronicity can be used as a negative measure of information efficiency. The above studies provide information explanations for the low market model R-squared documented by Roll (1988) and/or for the cross-country and cross-sectional variations in return synchronicity. To conclude, return synchronicity is low if there is more firm-specific information incorporated into stock prices than systematic information.

2.3 Limitation of Existing Literature

Merch, Yeung, and Yu (2000) assume the part of stock price variation driven by market-level information does not vary much across firms and across countries. However, how market-level information is incorporated into stock prices is also important and varies among different types of stocks. Chan and Hameed (2006) find that in emerging markets information production activities by analysts increase stock price comovement. This result indicates market-level information does influence stock price comovement. To the best of our knowledge, we have not seen any literature that

analyze how market-level and firm-specific information influence price comovement of both U.S. stocks and foreign stocks. Our paper studies this matter under the setting that U.S. stocks and foreign stocks trade in U.S stock markets.

2.4 Hypotheses

Following existing literatures (Morck, Yeung, and Yu, 2000, and Li and Myers, 2006), we define return synchronicity/stock price comovement as the R-Squared of the Capital Asset Pricing Model (CAPM). R-squared of CAPM is the relative amount of stock price movement explained by the market return movement against total movement. First of all, we would like to study whether there is any difference in return synchronicity/stock price comovement between U.S. firms and ADRs. Foreign firms' fundamentals tend to correlate more with local markets and less with the U.S markets. Therefore, if the stock prices of ADRs are informative enough, there would be a larger portion of firm-specific information than the information related to the U.S stock markets. In this case, ADRs have lower return synchronicity than U.S. firms with similar characteristics, such as size, industry, profitability, and etc. Our first hypothesis is, *return synchronicity of ADRs would be lower than that of U.S. firms (Hypothesis One).* However, if prices of ADRs are not informative enough, foreign firms' fundamental information is not well captured by stock prices. Then prices of ADRs would reflect not much more than just their correlation with the U.S. market. In this case, ADRs have higher return synchronicity than U.S. firms. It will not be very surprising if we reject our Hypothesis One.

Literature (Chan and Hameed, 2006) also documents that analyst coverage would help incorporate information into stock prices. As foreign firms, ADRs have a larger portion of information not related to the U.S. stock markets than do U.S. firms. Information production by analysts would help foreign market information related to ADRs incorporated into stock prices. Therefore we anticipate that *analyst coverage and forecast quality reduces return synchronicity more for ADRs than for U.S companies in the same industry and of similar size (Hypothesis Two).*

3. Data and Methodology

The primary sources of data for this study is the CRSP/COMPUSTAT merged database and the Institutional Brokers Estimate System (I/B/E/S) database. The main sample period is from 1991 to 2006. We drop the years from 2007 to 2012 because of following reasons. First of all, Ljungqvist, Malloy, and Marston (2009) document widespread changes to the historical I/B/E/S analyst recommendations. After the circulation of its working paper versions, I/B/E/S changed the format and available variables in 2007. We prefer using analyst forecast files before the significant change of the database to maintain the data originality. Moreover, analyst activities history for three brokers (Lehman, RBC Capital Markets, and ShinyoungSecurities) was completely removed due to the Disentitlement of contributors in 2009. Bank of America has officially disentitled WRDS from viewing all of their historical forecasts on Thomson (IBES and FC) feeds. Therefore we suspect the completeness and continuity of IBES data from 2007 to 2012 and constrain our sample period to 1991-2006.

We obtain SIC codes, stock prices, total numbers of shares outstanding data from CRSP. We exclude observations with share code other than 10, 11, 30, or 31, where ADRs have share code of either 30 or 31, and a price less than $1 per share at the end of the last calendar year. We obtain financial statement data, such as sales, book value of equity, net income and etc., from the CRSP/COMPUSTAT merged database. Table 1 illustrates descriptions for most of the variables to be used in our empirical analysis. The dependent variable used in this study is a logarithm transformation of R-squared. Similar to Morck, Yeung, and Yu (2000), for each year we regress each stock's weekly returns on weekly market returns including all stocks listed at NYSE, AMEX, and NASDAQ. To be included in the sample, each stock should have at least 31 weekly observations in a calendar year. The R-squared of each regression measures the percentage of the variation in weekly stock returns explained by the variation in weekly market returns. Because R-squared is bounded within the interval [0, 1] and is not normally distributed, following Morck, Yeung, and Yu (2000), we transform R-squared to the return synchronicity measure that ranges from negative infinity to positive infinity as.

$$Synch = \log\left(\frac{R^2}{1 - R^2}\right)$$

We use analyst coverage, mean forecast error, and forecast dispersion from I/B/E/S to proxy for the intensity and noisiness of information production. Analyst coverage is the number of analysts who issued annual earnings forecast from the latest update before each earnings announcement in the I/B/E/S Summary File. Forecast Dispersion is the standard deviation of each analyst's latest forecast scaled by the price at the previous year-end. Different firms have different magnitude of earnings. If we scale forecast dispersion by earnings, it is possible to have infinite values because earnings could be zero. Therefore, we scale forecast dispersion by stock price instead of earnings to make forecast dispersions across firms comparable. We have six control variables, leverage, firm size, stock price, total assets, revenue, and IPO age. Leverage is the short-term debt plus long-term debt divided by the total assets ((data34+data9)/data6) from COMPUSTAT. Size is the market cap constructed by multiplying the price per share and the total number of shares outstanding from CRSP. Total Assets and Revenue (as sales) are directly from COMPUSTAT. IPO age is the number of years since the firm first listed in the U.S. stock markets. To eliminate the effect of skewness, we use the logarithm of these five control variables in regressions. Table 1 describes all variables used in this paper.

To test the hypotheses, we first conduct a pair-wise comparison to see whether there are univariate results that the return synchronicity is significantly different between ADRs and U.S. firms. Also we look at other variables and see whether there are significant differences in firm characteristics, such as market power, information asymmetry, price, and risk, between ADRs and U.S. firms. Significant differences in Pearson correlation among variables between two groups will also provide indications to our hypotheses.

Table 1: Variable Descriptions

R-squared	R-squared of regressing a particular firm's weekly returns on weekly market index returns in a calendar year.
Synchronicity	Log transformation of Return R-squared Return Synchronicity = log (R-squared/(1-R-squared))
Idiosyncratic Volatility	Idiosyncratic volatility based on the annual CAPM regression described above.
Beat	The coefficient of market return based on the annual CAPM regression described above.
ROA	Return on assets, calculated as the sum of EBITDA plus deferred taxes from Income Statement, minus preferred dividends, divided by total assets ((DATA13+DATA50-DATA19)/DATA6) from COMPUSTAT.
Margin	Price-cost margin, calculated as (DATA13-DATA14)/DATA12
Analyst Coverage	Number of analysts who issued annual earnings forecast for a particular firm from the last updates at I/B/E/S before earnings announcements.
Forecast Dispersion	Standard deviation of each analyst's forecast error measured by the absolute difference between real earnings and forecasted earnings, scaled by last year end stock price, from the last updates at I/B/E/S before earnings announcements.
Size	Last year end total market value, calculated as price*total number of stocks outstanding.
Price	Last year end stock price
IPO Age	Number of years since the first date of public listing at U.S. stock markets.
Total Assets	Total assets (DATA6) last year end from COMPUSTAT.
Revenue	Sales (DATA12) last year end from COMPUSTAT.
Leverage	Short term debt plus long term debt divided by total assets ((DATA34+DATA9)/DATA6) from COMPUSTAT.

We then test our hypotheses by regress the return synchronicity measures on ADR dummy, information asymmetry, market power, and control variables. If the coefficient of ADR dummy is significant, the stock prices of ADRs and U.S. firms comove differently with the whole market. In addition to test the significance of ADR dummy variable, we interact ADR dummy variable with variables describing information asymmetry to see whether and how information asymmetry contributes to the difference in return synchronicity between ADRs and U.S. firms. Our major results come from the multivariate regression models with interaction terms shown below:

$$Synchronicity_{i,t} = a_{i,t} + \beta_1 ADR_i + \beta_2 ADR_i * Margin_{i,t} + \beta_3 ADR_i * Coverage_{i,t} + \beta_4 ADR_i * Dispersion_{i,t} + \beta_5 ADR_i * IPOAGE_{i,t} + \beta_6 ADR_i * Price_{i,t} + \sum \beta_l \, control\ variables_{i.t} + \varepsilon_{i,t}$$

Investigating incremental impacts of one independent variable on the coefficient of another independent variable is not a new methodology. To the best of my knowledge, this is the first paper to investigate the difference in stock price comovement between ADRs and U.S. firms, and also the difference of analyst coverage's impact on stock comovement between ADRs and U.S. firms. Using interaction term of ADR dummy and analyst coverage exactly tests what we want to investigate.

4. Finding and Analysis

We begin our analyses from checking univariate characteristics of variables we use for our study. Table 2 shows the summary statistics for groups of ADRs and U.S. firms.

Table 2: Summary Statistics

Panel A: Summary Statistics for U.S. firms (non-ADRs).

This panel shows summary statistics for U.S. firms, including number of observations, mean, 5th percentile, 25th percentile, median, 75th percentile, 95th percentile, and standard deviation of variables used in this study. All variables are described at Table 1. Sample period is from 1991 to 2006.

Variables	Obs	Mean	5th	25th	Median	75th	95th	Std. Dev.
Synchronicity	77481	-3.2684	-7.5599	-4.3106	-2.8086	-1.7015	-0.5645	2.2434
R-Squared	77481	0.1034	0.0005	0.0132	0.0569	0.1543	0.3625	0.1196
Idiosynchratic Vol.	77482	0.0673	0.0227	0.0379	0.0579	0.0861	0.1446	0.0398
Beta	77482	0.8392	-0.3402	0.2776	0.7387	1.3048	2.4029	0.8883
Margin	76715	-2.1110	-1.0506	0.0129	0.0782	0.1715	0.3548	84.0576
ROA	76549	0.0497	-0.3266	0.0208	0.0887	0.1567	0.2673	0.2485
Price	77482	29.2277	1.75	5.875	13.75	25.875	52.75	819.498
Total Assets	77480	3777.54	9.2955	54.747	232.2915	1006.98	11106.46	30607.18
Revenue	77286	1508.24	4.427	35.747	143.581	652.377	6182.4	7220.65
Size	77482	1848903.55	8373.44	38617	141743.9	649154.6	6201978	10984313
Leverage	76999	0.2022	0	0.0301	0.1631	0.3253	0.5615	0.1888
IPO Age	77482	13.9317	1	4	9	20	42	14.3830
Analyst Coverage	48822	7.7144	2	3	5	10	23	6.8198
Forecast Dispersion	48822	0.0528	0	0.01	0.02	0.06	0.3	0.1877

Panel B: Summary Statistics for ADRs and pair-wise comparison of variables between ADRs and non-ADRs (U.S. firms).

This panel shows summary statistics for ADRs, including number of observations, mean, 5th percentile, median, 95th percentile, standard deviation of variables used in this study, and the difference of these variables between ADRs and U.S. firms. All variables are described at Table 1. Sample period is from 1991 to 2006. The last column shows the difference of variables between ADR and non ADR firms. * indicates 10%, ** indicates 5%, and *** indicates 1% significance.

Variables	Obs	Mean	5th	Median	95th	std	Diff (ADR - Non ADR)	
Synchronicity	4398	-2.7783	-6.9289	-2.3218	-0.3015	2.1212	0.4901	***
R-Squared	4398	0.1339	0.0010	0.0893	0.4252	0.1363	0.0305	***
Idiosynchratic Vol.	4398	0.0556	0.0226	0.0468	0.1205	0.0323	-0.0117	***
Beta	4398	0.8253	-0.1245	0.7334	2.0576	0.7110	-0.0138	
Margin	4376	-0.7954	-0.3587	0.1072	0.3968	43.4808	1.3156	***
ROA	4321	0.1010	-0.0771	0.1079	0.2784	0.1363	0.0513	***
Price	4398	27.8703	2.9	19.75	79.6875	28.1477	-1.3574	***
Total Assets	4398	34095.46	77.632	3907.31	132075	123463	30317.9	***
Revenue	4389	10831.04	28.458	2220	54084.4	22363.4	9322.8	***
Size	4398	937189.00	2771	119146	3579308	4037563	-911715	***
Leverage	4360	0.2435	0	0.2375	0.5405	0.1689	0.0412	***
IPO Age	4398	8.9654	1	6	28	8.7826	-4.9663	***
Analyst Coverage	2726	5.6020	2	4	15	4.8763	-2.1124	***
Forecast Dispersion	2726	0.1346	0.01	0.09	0.85	0.2973	0.0818	***

There are much more U.S. firms than ADRs in our sample. The t-statistics of pair-wise comparison tell us that characteristics of ADRs are very different from those of U.S. firms. First of all, returns of ADRs move more synchronously with the U.S. stock market than U.S. firms do, because ADRs' R-squared is higher than U.S. firms' and ADRs' idiosynchratic volatilities are lower than U.S. firms'. As we discuss when we develop our hypotheses, the fact that majority of firm-specific information, including home country information, is not captured by stock prices explains higher R-squared for ADRs. In this case lower idiosynchratic volatility implies less information efficiency from the perspective of firm-specific information. The fact that there is no significant difference in market betas between ADRs and U.S. firms tells us ADRs and U.S. firms on average have similar correlation with the whole market. ADRs have higher R-squared only because firm-specific information is not well captured by stock prices. Second, Table 2 also shows there is higher information asymmetry in stock prices of ADRs than U.S. firms. The reason could be the facts that ADRs were followed by fewer analysts, and there were higher dispersion of opinions among analysts who followed them. Third, ADRs are significantly more profitable, larger, more levered, having lower per share price, and having been listed in the U.S. market for shorter periods than U.S. firms on average. These results indicate that the result of testing *Hypothesis One* should be return synchronicity of ADRs is higher than that of U.S. firms.

Table 3 shows Pearson correlations within two different groups. Both analyst coverage and forecast dispersion have lower absolute correlations with return synchronicity and idiosynchratic volatilities for ADRs than for U.S. firms. This result implies that analysts contribute less in processing firm-specific ADRs than for U.S. firms. Our control variables, Size, Total Assets, Revenue, and Price, which all imply levels of information

efficiency, have higher correlation with synchronicity within the ADR group than within the U.S. firm group. These results indicate return synchronicity of ADRs depends more on information efficiency than on fundamental characteristics, while U.S. firms' situation is the opposite.

Table 3: Pearson Correlations within the groups of ADRs and U.S. firms
This table reports Pearson correlations between Synchronicity/Idiosyncratic Volatilities and other variables.

	Synchronicity		Idiosynchratic Vol.	
	Non ADR	ADR	Non ADR	ADR
Idiosynchratic Vol	-0.1655	-0.13	1	1
Margin	0.0483	0.0716	-0.2533	-0.2341
ROA	0.092	0.089	-0.357	-0.2915
Analyst Coverage	0.3756	0.1161	-0.2888	-0.1318
Forecast Dispersion	0.033	0.0089	0.084	0.0308
Size	0.4711	0.3226	-0.3926	-0.2742
Total Assets	0.3834	0.2639	-0.545	-0.5772
Revenue	0.3671	0.2542	-0.4465	-0.5755
Leverage	-0.0102	-0.0041	-0.0542	-0.0625
IPO Age	0.15	0.018	-0.3527	-0.2871
Price	0.3367	0.1728	-0.4005	-0.3031

Table 4 reports the multivariate regression results, which are regarded as more reliable to test the impacts of interested variables than univariate results, because they have controlled other variables' influences. Here the dependent variable is return synchronicity.

Table 4: Multivariate Regressions

Coefficients are shown in the table and the t-statistics are below each coefficient and in the parentheses. Continuous variables are winsorized at 1% and 99% levels, except for price, which is winsorized at 99% level because we require minimal price as $1.

Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DummyADR	0.402	0.402	1.034	0.423	0.644	0.497	1.257
	(10.61)	(10.58)	(11.40)	(10.55)	(8.20)	(10.04)	(11.15)
ADR*Margin		-0.001					0.019
		(-0.07)					(0.93)
ADR*Coverage			-0.410				-0.398
			(-7.67)				(-7.10)
ADR*Forecast Dispersion				-0.164			-0.076
				(-1.63)			(-0.74)
ADR*IPO Age					-0.126		-0.113
					(-3.52)		(-3.07)
ADR*Price						-0.004	0.000
						(-2.98)	(-0.34)
Margin	-0.012	-0.012	-0.011	-0.012	-0.012	-0.012	-0.012
	(-2.62)	(-2.60)	(-2.43)	(-2.59)	(-2.68)	(-2.70)	(-2.58)
ROA	0.042	0.042	0.049	0.044	0.037	0.039	0.046
	(1.13)	(1.13)	(1.32)	(1.18)	(0.99)	(1.04)	(1.22)
Analyst Coverage	0.146	0.146	0.165	0.146	0.143	0.142	0.162
	(8.81)	(8.81)	(9.85)	(8.84)	(8.63)	(8.56)	(9.60)
Forecast Dispersion	0.049	0.049	0.060	0.069	0.047	0.050	0.067
	(1.46)	(1.46)	(1.78)	(1.93)	(1.41)	(1.50)	(1.89)
Size	0.375	0.375	0.381	0.375	0.373	0.372	0.379
	(42.79)	(42.79)	(43.34)	(42.80)	(42.45)	(42.30)	(42.69)
Total Assets	0.054	0.054	0.046	0.054	0.055	0.054	0.048
	(4.95)	(4.94)	(4.26)	(4.93)	(5.10)	(4.95)	(4.42)
Revenue	0.013	0.013	0.011	0.012	0.013	0.014	0.012
	(1.30)	(1.30)	(1.17)	(1.28)	(1.39)	(1.46)	(1.21)
Leverage	-0.279	-0.279	-0.269	-0.278	-0.284	-0.279	-0.273
	(-5.54)	(-5.54)	(-5.36)	(-5.53)	(-5.64)	(-5.56)	(-5.44)
IPO Age	-0.008	-0.008	-0.007	-0.008	-0.003	-0.008	-0.003
	(-0.94)	(-0.94)	(-0.88)	(-0.94)	(-0.33)	(-0.99)	(-0.30)
Price	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	(3.40)	(3.40)	(3.12)	(3.40)	(3.59)	(4.18)	(3.21)
Constant	-8.146	-8.145	-8.213	-8.148	-8.142	-8.129	-8.208
	(-57.52)	(-57.52)	(-57.91)	(-57.54)	(-57.50)	(-57.36)	(-57.78)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of OBS	81322	81322	81322	81322	81322	81322	81322
Adjusted R-squared	0.2918	0.2918	0.2923	0.2918	0.2919	0.2919	0.2924

In model (1), we find the coefficient of ADR dummy variable is positive and significant. That means ADRs have higher return synchronicity than U.S. firms after we control for information asymmetry, profitability, and other common control variables. The coefficient is also economically significant because the change of ADR dummy from 0 to 1 will increase return synchronicity by 0.402, which is approximately 15% of its mean and 18% of its standard deviation. That is consistent to the univariate results and implies that there is large information asymmetry for ADRs because a lot of firm specific information is not captured by stock prices. In models (2), (3), (4), (5), and (6), we test whether the interactions of the ADR dummy variable and variables related to information asymmetry and market power contribute to the difference of return synchronicity between ADRs and U.S. firms. Regression result of model (3) shows that the interaction of ADR dummy and Analyst Coverage has negative and significant impact on return synchronicity. Coefficient of the interaction is -0.41 and coefficient of

Analyst Coverage is 0.165. That means coefficient of Analyst Coverage for U.S. firms is 0.165 and for ADRs is -0.245, which is equal to the sum of -0.41 and 0.165. This result indicates that analysts do a good job in helping systematic information incorporated in stock prices for U.S. firms and they help firm specific information incorporated into prices for ADRs. This result is also economically significant because one standard deviation increase of Analyst Coverage leads to decrease of return synchronicity about 15% of its mean. Model (3) supports our second hypothesis that analyst following *reduces return synchronicity for ADRs.* Model (4) shows that there is no significant difference of the coefficients of Forecast Dispersion between ADRs and U.S. firms. Model (5) and (6) document negative interactive effects between ADR dummy and IPO Age, and between ADR dummy and stock price. These results also imply that ADRs with lower levels of information asymmetry tend to have lower return synchronicity because their firm specific information is better captured by stock returns.

Overall, our results show that ADRs have lower price comovement with the market and analyst coverage helps process firm-specific information for ADRs and therefore decrease price comovement of ADRs. We also find that analyst coverage helps process market-wide information for U.S. firms and therefore increases price comovement of U.S. firms. Different from Morck, Yeung, and Yu (2000), we put foreign firms and U.S. firms in a setting that they trade together and have comparable measures of market-wide information. Our results clearly indicate that there is no significant difference of market-wide information incorporated in the stock prices between U.S firms and ADRs. Difference in price comovement between ADRs and U.S firms is driven by difference in the transparency of firm-specific information.between two groups. Dasgupta, Gan, and Gao (2010) find that ADRs' price commoves more with the market because information asymmetry has been reduced during cross-listing process. We controlled the IPO age of ADRs and still find ADRs consistently have higher price comovement with the market. This high comovement gets reduced if followed by more analysts. Our results indicate that the high price comovement of ADRs is driven by the fact that firm-specific information is not efficiently incorporated into stock prices.

5. Concluding Remarks

We study stock price comovement of ADRs and find a puzzling result that stock prices of ADRs comove more with the U.S. market than stock prices of U.S. firms. In an ideal world where prices incorporate all information about firms (Efficient Market Hypothesis), ADRs would have lower return synchronicity because they are foreign firms and their stock prices will be influenced by home country economies. But in reality, stock prices of ADRs are not efficient and do not capture information outside of the U.S. market well. Analyst coverage helps incorporate firm-specific information and home country information into stock prices because we find the interaction of ADR dummy and analyst coverage has negative impact on return synchronicity. Furthermore, our results imply that analysts help process relatively more market-level information for U.S. firms and more firm-specific information for ADRs.

This paper has not directly pointed out the exact cause of differences of stock price comovement between ADRs and U.S. firms. To be more specific, we did not distinguish home-country information and firm specific information of ADRs, the summation of which is not well captured by stock prices. In addition, although stock

returns of ADRs and U.S. firms have similar betas, we yet do not have direct evidence that ADRs and U.S. firms have similar systematic risk. Future research could find natural experiments to identify the amount of firm specific information and local market information of ADRs and get further understanding of this issue.

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