Dissecting the Reaction of Global Equity Markets to Oil Price and Fed Policy Shocks

Yothin Jinjarak
NTU, Singapore
S3-B2A-06 Nanyang Avenue 639798
+65 8161 7711 (SG), +1 323 919 9926 (US)
yjinjarak@ntu.edu.sg
http://www.ntu.edu.sg/home/yjinjarak

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Abstract

Movements in the crude oil price and the U.S. Federal funds rate are associated with simultaneous buying and selling of U.S. investors in the global equity markets. During May 1989 to December 2006, following an unexpected increase by one standard deviation of the oil price (1.8 dollars per barrel) and the funds rate (10 basis points), excess equity returns across the broad market indices fall on the order of $1.3 - 2.7$ percent and $.1 - 1.5$ percent, respectively. Cross-country patterns of the reaction can be summarized by an international two-factor ICAPM model using market return and value premia of the global or regional portfolios. From a variance decomposition, reaction of dividend news to the oil price shocks account for more than 50 percent of innovations on current excess returns in Germany and the U.K., but below 30 percent in the U.S. and Japan; and the reaction to the funds rate shocks account for more than 60 percent in the U.S. and Germany, but below 40 percent in Canada and Japan. In a cross section of countries, one percent higher gravity-instrumented trade (financial) integration with the U.S. is associated with additional .11 percent ($-.17$ percent) reaction of the current excess equity returns to the oil price shocks and additional -4.56 percent (10.9 percent) reaction of the current excess equity returns to the funds rate shocks. Estimates obtained using the gravity-instrumented measure of economic integration differ in both quantitative and qualitative terms from those using the de facto measures, i.e. bilateral trade and financial flows divided by GDP, and correlations of equity returns between national markets. For the high book-to-market value portfolios, the reaction of dividend news to the oil price shocks is .1 percent lower than that of the growth portfolios, while the reaction of the discount rate news to the funds rate shocks is 6.7 percent higher.

1 Overview

Empirically, it is an open question of how global equity markets respond to movements in oil prices and Fed policy. Table 1 presents statistics on U.S. investors' holdings of global portfolios, as well as correlations of changes in the crude oil price (in dollars per barrel) and the Federal funds target rate (in percentage points), paired with gross equity flows and excess equity returns across regions. The correlation between gross purchases and gross sales is almost one. The changes in oil price and Fed policy are associated with simultaneous buying and selling of global equities; oil price increases are associated with net sales of global equity portfolios, whereas the opposite characterizes the global markets' response to the tightening of Fed policy. The negative effects of oil prices on equity returns are twice the size those of the Federal funds rates.

Table 1: **Correlations of crude oil prices, Federal funds rates, and U.S. investors' global equity flows.** Monthly data spanning May 1989 - December 2006. The prices of crude oil are in dollars per barrel (source: Energy Information Administration). The Federal funds target rates are in percentage points (source: CBOT; Datastream). Each region's market capitalization (percentage of global capitalization; source: the World Bank's World Development Indicators) and holdings by U.S. investors (percentage of region's market capitalization; source: U.S. Treasury's International Capital System) are as of the beginning of 2006. GP, GS, NP, ER are gross purchases, gross sales, net purchases, and excess equity returns, respectively. All returns are value-weighted in dollars of MSCI portfolios (Fama-French). EAFE is an abbreviation for Europe, Australia, and the Far East; EURO for European markets; SCAN for Scandinavian markets; ASIA for Asian markets.

	EAFE	EURO	SCAN	ASIA
Share in Global Market Capitalization (percent)	41.1	22.9	2.3	16.0
Holdings by U.S. Investors (percentage of market capitalization)	12.2	14.2	22.4	9.3
Correlations of:				
(GP,GS)	.998	.997	.974	.992
Oil price changes with GP	-.008	-.004	-.070	-.012
GS	-.002	.004	-.057	-.011
NP	-.067	-.079	-.060	-.011
ER	-.112	-.138	-.078	-.042
Federal Funds rate changes with GP	.160	.149	.243	.170
GS	.158	.148	.195	.173
NP	.071	.039	.213	.044
ER	-.053	-.085	-.044	-.037

The statistics in Table 1 have significant implications for international macroeconomics and finance. In the context of financial economics, news about the oil prices and Fed policy generate a shock on equity investment held by heterogeneous population of investors, resulting in a positive contemporaneous correlation between the U.S. investors' gross purchases and gross sales in global equity markets. This mechanism is plausible when macroeconomic shocks induce sophisticated U.S. investors (i.e. the investors with better access to private information on world-wide investment opportunity) to purchase equities in international markets from unsophisticated U.S. investors [Albuquerque and Bauer (2007), Bauer and Vega (forthcoming), Hau and Rey (2006b)]. Related empirical regularities are (i) that a tightening of Fed policy causes a drop in U.S. equity markets [Bernanke and Kuttner (2005), Chen (2007), Petalis (1997), Rigobon and Sack (2003, 2004), Thorbecke (1997)] and global markets [Ehrmann and Fratzscher (2004, 2006), Conover et al. (1999)], and (ii) that national equity markets are positively correlated in responding to macroeconomic and global factors [Albuquerque and Vega (2007), Andersen et al. (2007), Ammer and Wongswan (2007), Craine and Martin (forthcoming)]. An innovation in current excess equity return can be decomposed into

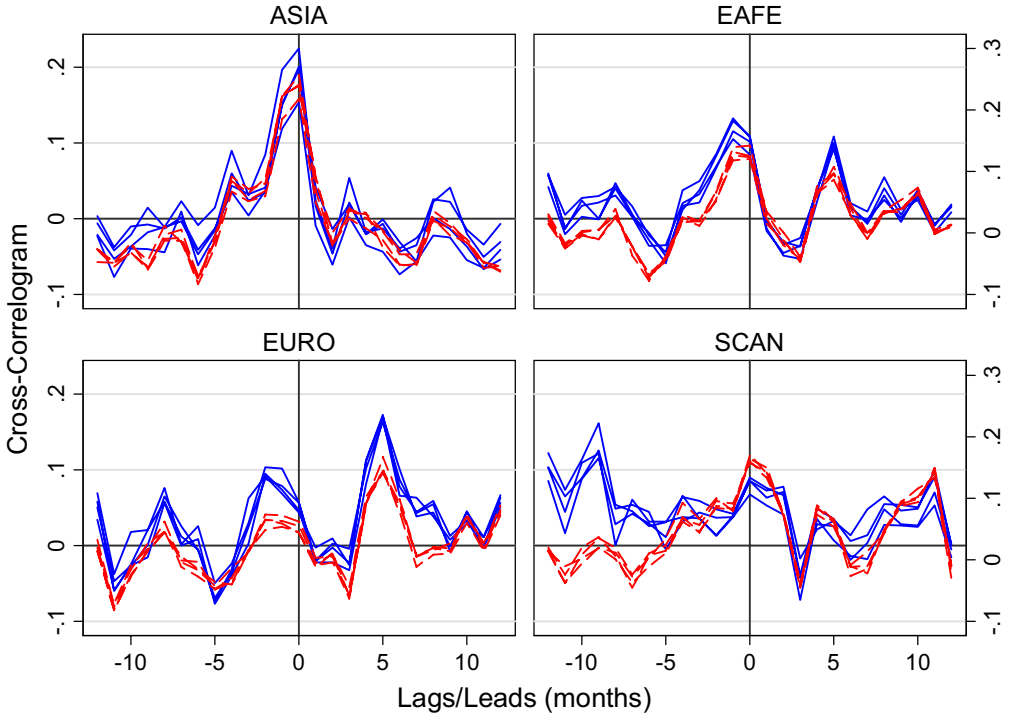
the discounted sum of return revisions in future dividends, real interest rates, expected future excess equity returns and real exchange rates [Ammer and Mei, 1996]. As the responses to the oil price and Fed policy changes, the return revisions should be determined by both returns in the U.S. and global equity markets. This determination is likely to be done among heterogeneous investor population and not simply between the U.S. and global representative investors. How it differs across countries and portfolios is therefore an empirical question.

In the context of macroeconomics, gauging the reaction of asset prices helps answering a long standing empirical question of whether oil or monetary policy is a major source of economic fluctuations (Bernanke et al., 1997). Movements in equity prices capture people's expectation about future economic growth at home and abroad; there is some evidence that the innovation in equity prices is contemporaneously orthogonal to total factor productivity, but highly correlated with the shock explaining long-run movements in the productivity (Beaudry and Portier, forthcoming). The literature have so far considered the reaction of equity returns to oil prices separately from the reaction to Fed policy. For the postwar period to early 1990s, Jones and Kaul (1996) find that the impact on cash flows (i.e. dividends) alone can account for the reaction of the U.S. and Canadian equity prices to oil shocks. Kilian and Park (2007) report that the U.S. equity market reacts negatively to oil-market specific demand shocks (e.g. precautionary demand), but positively to aggregate demand shocks at the global level. For the reaction to Fed policy, Bernanke and Kuttner (2005) find that expected returns account for the largest part of the response of U.S. equity markets. As documented in Bernanke et al. (1997), all the recessions from 1970s to early 1990s had been preceded by both oil price increases and a tightening of monetary policy. A joint investigation on the reaction of equity markets at the global level is naturally a next step in gathering evidence on the direct and immediate influence of oil prices and Fed policy on the macroeconomy.

In the context of international economics, measuring global equity markets' reaction to oil prices and Fed policy adds more evidence of cross-border risk sharing in a natural experiment. Related empirical regularities are (i) that gross capital flows are much larger than net capital flows [Obstfeld and Rogoff (2001), Dooley (1996)], and (ii) that the larger the volume of trade and financial integration together with the higher the similarity between two countries are associated with the higher the correlation between the countries' equity returns [Aviat and Coeurdacier (2006), Portes and Rey (2005), Forbes and Chinn (2004), Imbs (2004)]. The correlations in Table 1 indicate that an increase in oil price and Federal funds rate generate two-way international flows of global equities. Since the observed correlations of equity returns in the literature may be endogenous to the level of cross-border financial holdings, the reaction of global equity returns to exogenous movements in oil price and Fed policy provides another aspect equity market correlations, thereby contributing to research on the benefits of risk diversification via international portfolio investment [e.g., Coeurdacier et al. (2007), Devereux and Sutherland (2006), Engel and Matsumoto (2006)].

The gist of an empirical solution is in Figure 1. Depicted in the figure are the monthly cross-correlograms of net purchases by U.S. investors and excess equity returns formed on value-growth premia; the solid lines representing the correlograms of high-value ('value portfolio') market excess returns, and dash lines representing those of low-value ('growth portfolio') market excess returns. According to the four alternative measures of value premia [Fama and French, 1998: book-to-market (B/M), cash flow to price (C/P), dividend to price (D/P), and earnings to price (E/P)], return chasing is evident in the data. The U.S. investors' net purchases are positively correlated with both current and lagged global equity returns, with the highest correlation in Asian markets. Although the return chasing is by itself not a surprise (Bohn and Tesar, 1996), but we can see the cross-correlograms tend to be higher for the value portfolios. Guidolin and Timmermann (forthcoming-a) find some evidence of time-variations in the joint distribution of returns on a stock market portfolio and portfolios tracking size- and value effects, such that mean returns, volatilities and correlations between these equity portfolios are found to be driven by underlying regimes that introduce short-run market timing opportunities for investors. Since the value spread is a useful predictor of equity returns (Liu, forthcoming) and the patterns of the cross-correlograms vary markedly across localities of the equity markets, I use these stylized facts to guide the empirical analysis.

Figure 1: **Net purchases of U.S. investors and global excess equity returns.** The figure reports for 1977-2006 the monthly cross-correlograms of excess equity returns of MSCI portfolios by regions (Fama-French) and net purchases of U.S. investors (U.S. Treasury's TIC). Excess equity returns are calculated as the dollar returns minus the 1-month U.S. Treasury bill rate. The solid lines represent high-value ('value portfolio') market excess returns, and the dash lines represent low-value ('growth portfolio') market excess returns. EAFE is an abbreviation for Europe, Australia, and the Far East; EURO for European markets; SCAN for Scandinavian markets; ASIA for Asian markets.



To understand the reaction of equity returns in Table 1 with the help of Figure 1, I first use futures data to break the movements in oil price and Federal funds rate into expected and unexpected components, and examine asset pricing implication for the global equities. I then decompose the reaction of U.S. and global excess equity returns into news (revisions in expectation) about dividend, interest rate, future excess returns, and real exchange rate. In the last step, I estimate how much the reaction is attributable to asset pricing factors and cross-border economic integration. The sample period is January 1977 to December 2006, covering all of the Fama and French's MSCI country portfolios (the Appendix provides more details). Together with the U.S., these equity markets represent more than 80% of the global market capitalization. By 2006, the U.S. investors' holdings registered more than 12% of market capitalization in these markets. From the empirical perspective, the transmission of oil price and Fed policy shocks to the global equity markets deserves to be studied in this set of countries.

I find that following an unexpected increase by one standard deviation of the oil price (1.8 dollars per barrel) and the Federal funds rate (10 basis points), excess equity returns across the broad market indices fall on the order of $1.3 - 2.7$ percent and $.1 - 1.5$ percent, respectively. Cross-country patterns of the reaction can be summarized by an international two-factor ICAPM model using market return and value premia of the global or regional portfolios. Using a variance decomposition, I find that reaction of dividend news to the oil price shocks account for more than 50 percent of innovations on current excess equity returns in Germany and the U.K., but below 30 percent in the U.S. and Japan. The reaction of dividend news to the funds rate shocks account for more than 60 percent in the U.S. and Germany, but below 40 percent in Canada and Japan. In a cross section of countries, one percent higher gravity-instrumented trade (financial) integration with the U.S. is associated with additional .11 percent ($-.17$ percent) reaction of the current excess equity returns to the oil price shocks and additional -4.56 percent (10.9

percent) reaction of the current excess equity returns to the funds rate shocks. I also find that the results from the estimation using the gravity-instrumented trade and financial integration differ in both quantitative and qualitative terms from those using the de facto measure, i.e. bilateral trade and financial flows divided by GDP, and covariances or correlations of the equity returns between national markets. For the high book-to-market value portfolios, the reaction of dividend news to the oil price shocks is .1 percent lower than that of the growth portfolios, while the reaction of the discount rate news to the funds rate shocks is 6.7 percent higher.

2 Diagnosis

2.1 Measuring Oil Price and Fed Policy Shocks

Because the financial markets are forward looking, only the unexpected component of the movements in oil price and Fed policy will influence the innovation in excess equity returns. To measure the unexpected, *surprise*, component, I follow the methodology of Kuttner (2001) and Bernanke and Kuttner (2005) in constructing the expected and unexpected components of Federal funds rate. I then apply the same methodology to the oil prices. Specifically, using the futures data, the unexpected component of oil price (o, in dollars per barrel) and Federal funds rate target (i, in percentage points) is constructed as

$$\overline{\Delta} s_t^u = \frac{1}{D} \sum_{d=1}^{D} s_{t,d} - f_{t-1,D}^1 \tag{1}$$

where $s = \{o, i\}$; $s_{t,d}$ is the rate on day d of month t, and $f_{t-1,D}^1$ is the rate of the 1-month futures contract on the last (Dth) day of month $t-1$. The notation $\overline{\Delta}$ is used to distinguish this from first-difference operator. The expected component is constructed as

$$\overline{\Delta} s_t^e = f_{t-1,D}^1 - s_{t-1,D} \tag{2}$$

$\overline{\Delta} s_t^e + \overline{\Delta} s_t^u = \overline{\Delta} s_t$ is the average in month-t minus the value on the last day of month $t-1$. I exclude the September 17, 2001 observation for the Federal funds rate as it was the rate cut on the first trading day after the September 11 event. Table 2 reports the statistics.

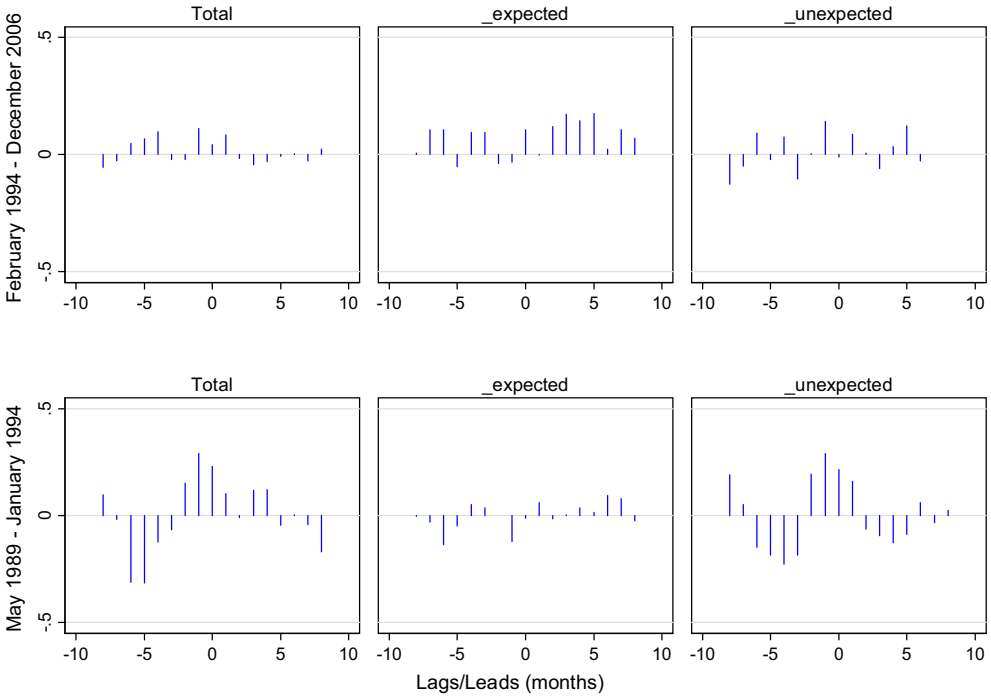
Table 2: **Oil Price - Federal Funds Rate Statistics.** The table reports descriptive statistics of the oil price and Federal funds rate movements. The futures prices are used to break the total change into expected and unexpected components. The statistics for Federal funds rate exclude the September 17, 2001 observation.

		May 1989 - January 1994	February 1994 - December 2006
(I) Oil price	Number of Changes	56	148
	Standard deviation:	1.62	1.96
	...expected	.08	.11
	...unexpected	1.61	1.96
(II) Federal Funds rate	Number of Changes	24	49
	Standard deviation:	.22	.22
	...expected	.23	.16
	...unexpected	.18	.10
	Correlation of (I) and (II):	.10	.06
	...expected	-.19	.09
	...unexpected	.25	-.02

Using this measure, from May 1989 to December 2006 there are 242 oil price changes and 73 Federal funds rate

changes. The standard deviations indicate that the unanticipated components make up most of the movements in oil price. The funds rate surprise is approximately 18 basis points pre-1994 and 10 basis points post-1994. From February 1994 onwards, the Federal Reserve announces all the changes in its target rate, the action which eliminates uncertainty about the date of rate changes. Since the fund rate changes for both pre- and post 1994 periods are 22 basis points, the announcements reduce by half the fraction of unexpected component in the total funds rate changes. Between pre- and post 1994 periods, the correlation of movements in oil price and Federal funds rate declines from .10 to .06. Although the oil futures may be correlated with inflation (Gorton and Rouwenhorst, 2006) and thus with the Fed policy, but the exposure of the oil futures to the unexpected inflation tends to vary over time (Erb and Harvey, 2006). Reported in Figure 2 are the monthly cross-correlograms of the movements in the Federal funds rate and oil price, for the total change, as well as the expected and unexpected components. Before the February 1994, the relationship was negative during [-6,-3] and positive during [-2,1] months. After the February 1994 we can see a significantly smaller co-movement, driven mainly by the unexpected components. Hence, there is no supportive evidence of any systematic co-movement between the oil- and Fed policy surprises in the post-1994 sample period.

Figure 2: **Oil Price - Federal Funds Rate Cross-Correlograms**. The figure depicts for May 1989 - December 2006 the monthly cross-correlograms of oil price and Federal funds rate movements. The expected and unexpected components are constructed from the futures data on the crude oil price and funds rate target.



Four measurement issues are in order. First, I make no distinction between target surprises and path surprises of oil price and Fed policy. Identifying the most robust market commentaries, surveys and financial prices to derive the target and path surprises for both the oil price [i.e., Cavallo and Wu, (2006), Wu and McCallum (2005)] and Fed policy [i.e.,Gurkaynak et al. (2005), Romer and Romer (2004)] is an ongoing research agenda, but beyond the scope of this paper. Further, Piazzesi and Swanson (forthcoming) suggest that the measures of Fed policy shocks require some adjustment if there exists risk premia in the Federal funds futures. They find the Fed policy shocks based on the one-day change in the funds futures around FOMC announcements pioneered by Kuttner (2001) and being used in the present analysis are robust to the presence of risk premia. Given that post-1994 rate changes were

always expected to occur at schedule FOMC meetings, measuring the funds rate surprises in terms of the average funds rate at the monthly frequency should not make time aggregation a major issue (Bernanke and Kuttner, 2005). Similarly, prices of crude oil futures may convey useful information regarding shifts in market expectations about future demand and supply conditions in the crude oil market, but the prices of oil futures would be expected to forecast spot prices only under certain restrictive conditions; how well these forecasts work in practice depends on the properties of risk premium (Alquist and Kilian, 2007).

Second, the funds rate surprises may endogenously react to economic conditions, including the equity markets and other macroeconomic news besides the oil prices. Although the central banks may generally not want to respond to movements in asset prices (Bernanke and Gertler, 2001), it is also possible that central banks' respond to movements in equity prices driven by relative productivity shocks may yield some price stability benefits (e.g. Di Giorgio and Nistico, 2007). One way to get around the endogeneity issue is to use the fact that since the Federal Reserve began in February 1994 the policy of announcing changes of the target rate, there has been no uncertainty about the date of rate changes. Bernanke and Kuttner (2005) find that after the February 1994, there is little evidence that the funds rate reacts to macroeconomic news. So there is some comfort in using $\overline{\Delta} i_t^u$ to measure the Fed policy surprise for the period after February 1994.

The third measurement issue is the role of local authority's monetary policy. Andersson (2007) finds in the European markets sample a muted reaction of financial markets to the local monetary policy decisions, comparing to a more significant reaction of the U.S. equity markets to the Fed policy. Similarly, Conover et al. (1999) find in fifteen national equity markets that the explanatory power of the U.S. monetary conditions is higher than that of the local monetary conditions. However, Craine and Martin (forthcoming) report that equity returns in the Australian market respond to both the Federal Reserve's and the Reserve Bank of Australia policy. There is no straightforward way to measure the unexpected component of the local authorities' monetary decision because there is no futures contract being traded for the local monetary decisions like the Federal funds futures. Nevertheless, if there is monetary interdependence between the Fed and the local central banks, then we may be able to consider only the Fed policy shocks. There are several empirical studies supportive to the monetary interdependence. Bergin and Jorda (2004) find significant policy interdependence in the central bank issued policy rate targets for fourteen OECD countries during 1980 to 1999. Scotti (2006) also finds some synchronization between the Federal Reserve and the ECB policy during 1999 to 2005. Because interactions between the central banks depend on policy competition, coordination, commitment to future policies [i.e. Cooley and Quadrini (2003), Ehrmann and Fratzscher (2007), Gosselin et al. (2007), Pappa (2004), Taylor (2007)], we can consider the shocks derived from the Federal funds rate as the resultant monetary interdependence distilled by the financial markets through the funds futures prices. Lastly, the reaction of equity markets to oil price and Fed policy shocks may be asymmetric in several dimensions. Hamilton (2003) finds that the effects on GDP growth of oil price increases are more important than those of oil price decreases, and the increases have significantly less predictive content if they simply correct earlier decreases. Ehrmann and Fratzscher (2006) find none of the specific characteristics of the Fed's interest-rate decisions (i.e. direction, size, and non-action) is statistically significant on the reaction of fifty global equity-market indices over the period 1994-2004. Due to the sample size of time series, I do not identify demand versus supply shocks in the crude oil market, boom versus bust business cycles, and asymmetric reaction during extended periods of declining oil prices and funds rates.

2.2 Value Premia and the Oil Price-Fed Funds Rate Shocks

Tables 2 and 3 report pairwise correlations between the oil price and Fed policy shocks and excess equity returns (in dollars) of U.S. and global portfolios formed on the four alternative measures of firm value (B/M, E/P, C/P, D/P), as well as the value premia [returns of the high (H) minus those of the low (L) value portfolios]. To take into account the policy of February 1994, I report correlations for both pre- and post February 1994 samples. Before February 1994, the unexpected components of the oil prices are negatively correlated with the equity returns of the U.S. and

global markets, for both the value and growth portfolios, but not the value premia. Over the same period, the equity returns of the value and growth portfolios in the U.S. and the value premia in the European markets are negatively correlated with the unexpected component of the Fed policy. After February 1994, the expected components of the oil prices are negatively correlated with the equity returns of the European markets, for both the value and growth portfolios, but not the value premia. For the European markets, the value premia and the expected component of Fed policy are negatively correlated, whereas for the Asian markets and the global portfolios, the value premia and the unexpected component of Fed policy are positively correlated.

What explains the correlations of the oil price - Fed policy shocks and value premia? At the macro level, credit (i.e., bank loans) and money (i.e., bank deposits) are monetary policy channels of the Federal funds rate [Bernanke and Blinder (1992), Bernanke and Gertler (1995)]. An unexpected increase of oil price or Federal funds rate may increase the value premia through financial friction, which drives cash-flow shocks to affect investment propagating mainly through large firms (Dow et al., 2005). Large-cap stocks tend to realize higher comovements than small-cap stocks across countries, and global pricing is found to be rejected for most small-cap stocks (Huang, 2007). The financial friction is a common factor in pricing of cross-sectional returns that is more important in good economic conditions (Gomes et al., 2006) and the value betas tend to covary positively with the expected market risk premium (Petkova and Zhang, 2005). Further, financial leverage may amplify the book-to-market effect, thereby increasing the value premia among firms with a higher likelihood of financial distress (Garlappi and Yan, 2007). Alternatively, if a temporary random deviation of the price of a stock from its intrinsic value creates value effect (Arnott et al., 2007), the announcement policy of February 1994 may lower the noise in the U.S. markets, but increase it elsewhere, particularly in Asia. The funds rate surprise may also increase the value premia because returns on international equities are characterized by jumps and systemic risk reduces both the gains from international diversification and penalize investors for holding levered positions (Das and Uppal, 2004). Given the extant of evidence, I consider the value premia as an empirical proxy for the financial friction in the discussions to follow.

Table 3: **Correlations between U.S. equity portfolios and the oil price - Federal funds rate movements.** The table reports pairwise correlations between the changes in oil price and Federal funds rate with U.S. portfolios formed on value-growth premia. The expected (Δs_t^e) and surprise (Δs_t^u) components of the change in the oil price (o) and Federal funds rate (i) are constructed from the futures data of crude oil and Federal funds futures data. The 1-month returns on the MSCI (Fama-French) U.S. portfolios are formed on four alternative measures of value-growth premia: book-to-market (B/M), earnings to price (E/P), cash flow to price (C/P), and dividend to price (D/P). $H(L)$ denotes value (growth) portfolios. $H-L$ is the difference between returns of the high-value and the low-value portfolios. Bold signifies statistically significant at 10 percent level.

U.S. equity portfolios									
Changes in		...Oil Prices				...Federal Funds Rates			
Period		Pre 1994		Post 1994		Pre 1994		Post 1994	
Portfolio		$\overline{\Delta} o_t^e$	$\overline{\Delta} o_t^u$	$\overline{\Delta} o_t^e$	$\overline{\Delta} o_t^u$	$\overline{\Delta} i_t^e$	$\overline{\Delta} i_t^u$	$\overline{\Delta} i_t^e$	$\overline{\Delta} i_t^u$
Book to Market (B/M)	Value (H)	-.11	**-.19**	-.07	-.08	.15	**-.32**	-.06	-.09
	Growth (L)	-.08	**-.23**	**-.14**	-.09	.09	**-.39**	-.01	-.11
	Value Premia ($H-L$)	-.02	.13	.12	.02	.05	.17	-.06	.05
Earnings to Price (E/P)	Value (H)	-.14	**-.23**	-.08	-.09	.13	**-.41**	-.07	-.03
	Growth (L)	-.05	**-.18**	**-.14**	-.07	.10	**-.37**	-.02	-.10
	Value Premia ($H-L$)	-.15	-.06	.11	-.03	.06	-.07	-.07	.10
Cash flow to Price (C/P)	Value (H)	-.08	-.16	-.06	-.07	.12	**-.37**	-.06	-.03
	Growth (L)	-.07	**-.22**	-.13	-.09	.11	**-.38**	-.01	-.11
	Value Premia ($H-L$)	.01	**.19**	.12	.04	-.01	.12	-.06	.12
Dividend to Price (D/P)	Value (H)	-.10	-.13	-.03	**-.16**	.12	**-.40**	-.09	-.06
	Growth (L)	-.10	**-.23**	-.12	-.08	.12	**-.40**	-.03	-.08
	Value Premia ($H-L$)	.04	**.24**	.12	-.07	-.06	.17	-.05	.04

Table 4: **Correlations between global equity portfolios and the oil price - Federal funds rate movements.** The table reports pairwise correlations of the changes in oil price and Federal funds rate with global portfolios formed on value-growth premia. The expected (Δs_t^e) and surprise (Δs_t^u) components of the change in the oil price (o) and Federal funds rate (i) are constructed from the futures data of crude oil and Federal funds futures data. The 1-month dollar returns on the MSCI (Fama-French) global portfolios are formed on four alternative measures of value-growth premia: book-to-market (B/M), earnings to price (E/P), cash flow to price (C/P), and dividend to price (D/P). $H(L)$ denotes value (growth) portfolios. $H-L$ is the difference between returns of the high-value and the low-value portfolios. Bold signifies statistically significant at 10 percent level.

Market		Global equity portfolios (EAFE)								Asia and the Pacific equity portfolios (ASIA)							
Period		Pre 1994		Post 1994		Pre 1994		Post 1994		Pre 1994		Post 1994		Pre 1994		Post 1994	
Portfolio		$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$	$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$
B/M	H	.14	**-.20**	**-.22**	-.02	.07	-.13	-.08	-.01	.08	**-.16**	-.11	.09	.07	-.06	-.03	.01
	L	.13	**-.24**	**-.23**	.00	.01	-.10	.01	-.10	.09	**-.21**	**-.15**	.12	.04	-.08	-.01	-.12
	$H-L$	.00	.10	-.02	-.03	.16	-.08	**-.15**	.14	-.04	.10	.02	.00	.06	.05	-.03	**.15**
E/P	H	.13	**-.23**	**-.22**	-.01	.06	-.13	-.07	-.02	.09	**-.19**	**-.15**	.08	.06	-.07	-.08	-.01
	L	.13	**-.25**	**-.22**	-.01	.00	-.09	.01	-.12	.09	**-.21**	-.13	.11	.02	-.08	-.01	-.14
	$H-L$	-.03	.08	.00	-.01	.15	-.07	**-.14**	**.17**	-.03	.11	.02	-.08	.06	.07	-.09	**.20**
C/P	H	.13	**-.24**	**-.23**	.01	.07	-.14	-.08	-.01	.07	**-.22**	-.12	.09	.07	-.08	-.04	-.02
	L	.13	**-.27**	**-.21**	-.01	-.01	-.07	.02	-.11	.10	**-.25**	-.12	.12	.01	-.06	-.01	-.13
	$H-L$	.00	.08	-.05	.03	**.20**	-.15	**-.15**	**.14**	-.06	.07	.01	-.06	.12	-.03	-.04	**.18**
D/P	H	.11	**-.27**	**-.19**	-.02	.07	-.15	-.06	-.02	.04	**-.27**	-.06	.07	.07	-.08	-.04	.00
	L	.15	**-.24**	**-.23**	-.02	.00	-.09	-.01	-.10	.12	**-.21**	**-.14**	.11	.02	-.08	-.01	-.11
	$H-L$	-.11	-.06	.10	.00	.18	-.16	-.07	**.14**	**-.17**	-.13	.11	-.07	.10	.01	-.03	**.14**

Market		European equity portfolios (EURO)								Scandinavian equity portfolios (SCAN)							
Period		Pre 1994		Post 1994		Pre 1994		Post 1994		Pre 1994		Post 1994		Pre 1994		Post 1994	
Portfolio		$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$	$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}o_t^e$	$\overline{\Delta}o_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$	$\overline{\Delta}i_t^e$	$\overline{\Delta}i_t^u$
B/M	H	**.19**	**-.22**	**-.22**	-.08	-.02	-.14	-.06	-.04	.10	**-.17**	**-.20**	-.01	.12	-.12	-.05	-.03
	L	**.17**	**-.23**	**-.24**	-.08	-.12	-.08	.06	-.09	.14	**-.18**	-.14	-.01	.04	-.11	.00	-.14
	$H-L$	.08	.01	-.05	-.04	**.21**	-.18	**-.19**	.05	-.03	-.03	-.01	.00	.14	-.07	-.04	**.14**
E/P	H	.14	**-.25**	**-.20**	-.06	-.01	-.16	-.04	-.05	.09	**-.18**	**-.20**	.03	.11	-.13	.00	-.05
	L	**.18**	**-.23**	**-.22**	-.08	-.11	-.08	.05	-.09	.12	**-.19**	-.14	-.04	.06	-.10	.00	**-.14**
	$H-L$	-.10	-.06	.00	.02	**.23**	**-.21**	**-.16**	.06	-.02	-.01	-.01	.08	.09	-.08	.00	.13
C/P	H	**.18**	**-.21**	**-.23**	-.03	.00	-.15	-.07	-.04	.03	-.13	**-.19**	.06	.09	-.18	-.02	-.01
	L	.16	**-.23**	**-.22**	-.09	-.10	-.07	.06	-.09	**.17**	**-.18**	-.13	-.04	.02	-.08	-.01	-.13
	$H-L$	.06	.06	-.07	.07	**.22**	-.17	**-.18**	.05	**-.19**	.06	.00	.10	.09	-.15	-.01	**.15**
D/P	H	**.20**	**-.19**	**-.19**	-.06	-.03	-.18	-.04	-.05	.09	**-.19**	**-.19**	-.02	.13	-.16	-.03	-.05
	L	.16	**-.23**	**-.23**	-.09	-.09	-.08	.01	-.09	.15	**-.20**	**-.15**	-.01	.01	-.04	.00	-.12
	$H-L$	.07	.14	.06	.05	.15	**-.21**	-.09	.07	-.07	-.01	.04	.00	.18	-.18	-.02	.12

Table 5: **The response of country portfolios to oil price and Federal funds rate shocks.** The table reports the coefficient estimates from regressions of the global excess equity dollar returns (in percentage) indicated in the row headings on the expected (Δs_t^e) and surprise (Δs_t^u) components of the one-month change in the oil price (o, in dollars per barrel) and Federal funds rate (i, in percentage points): $e_t = a + B^e \Delta s_t^e + B^u \Delta s_t^u$, where $s = [o, i]'$. The equity returns are the value-weighted MSCI country portfolios (Fama-French). The futures data are used to break the total change of oil price and Fed funds rate into expected and unexpected components. The regressions also include an intercept (a) and calculate heteroscedasticity robust standard errors, whose estimates are not reported. *(**,***) signifies statistically significant at 10(5,1) percent level. The table also reports for each explanatory variable its standard deviation during the corresponding period. The full sample comprises 212 monthly observations spanning May 1989 - December 2006.

Dependent variable	Explanatory variables				*Interaction with a dummy for post February 1994 period*					
Excess equity returns	$\overline{\Delta} o_t^e$	$\overline{\Delta} o_t^u$	$\overline{\Delta} i_t^e$	$\overline{\Delta} i_t^u$	$\overline{\Delta} o_t^e$	$\overline{\Delta} o_t^u$	$\overline{\Delta} i_t^e$	$\overline{\Delta} i_t^u$	R^2	*obs.*
e_t std. dev.=	.1	1.8	.1	.1	.1	2.0	.2	.1		
United States	2.5	-.7 **	-4.4	-10.3 ***	-8.7	.5	4.9	-.3	.10	210
Global, ex-U.S.	15.4	-1.1 **	-3.9	-6.1	-24.2 **	1.1 **	5.1	-2.6	.11	210
Asia and the Pacific	13.5	-1.3 **	-2.1	-4.5	-20.2	1.5 **	2.5	-6.7	.07	210
Europe	17.9 **	-1.0 **	-8.4 *	-9.5 **	-27.0 ***	.8 *	10.6 **	2.0	.13	210
Scandinavia	9.2	-.9 *	-.1	-3.3	-20.0	.9	1.6	-14.8	.07	210
Australia	19.6	-1.0	-14.3 *	-7.9	-24.3	.8	16.4 *	14.8 *	.07	210
Austria	13.2	.1	-6.5	-8.0 *	-17.8 *	.1	3.6	1.5	.03	210
Belgium	16.9	-1.2 ***	-7.4 *	-8.3	-28.2 **	.8 *	12.7 **	4.6	.14	210
Canada	.0	-.1	-1.1	-4.2	-5.4	.5	4.7	-7.4	.05	210
Switzerland	19.8 **	-1.1 ***	-8.0 *	-10.7 **	-28.5 ***	.8 *	12.2 **	7.1	.14	210
Germany	19.2 **	-1.3 **	-13.2 **	-7.7 *	-30.7 ***	.9	17.6 **	1.3	.12	210
Denmark	21.6 **	-.7 *	-14.8 ***	-14.6 ***	-32.9 ***	.6	22.9 ***	1.3	.14	208
Spain	11.3	-1.5 ***	-2.2	-5.8	-19.7	1.1 *	2.2	-1.5	.09	210
Finland	-9.7	-.8	12.0 *	13.9 **	.6	.7	-16.2	-42.4 ***	.05	210
France	15.8 *	-1.2 **	-7.5	-8.0 *	-27.2 **	1.0 *	9.3	1.4	.11	210
United Kingdom	20.9 **	-.8 **	-8.0	-11.6 **	-26.6 **	.6	7.7	4.1	.10	210
Hong Kong	14.2	-1.0 **	-2.7	-6.3	-15.5	1.0 **	1.3	-1.7	.03	210
Ireland	8.5	-.3	-2.6	-11.2 *	-15.0	.0	3.3	4.8	.05	184
Italy	-.7	-1.2 **	-4.0	-.5	-13.8	1.4 **	4.6	-12.4	.08	210
Japan	13.6	-1.4 **	-1.9	-4.1	-20.9	1.7 **	3.2	-9.2	.07	210
Malaysia	-67.3	-.9	-75.0 *	-30.0	60.8	1.2	83.4 *	35.4	.04	91
Netherlands	18.2 **	-.7 *	-8.4 **	-10.6 **	-30.1 ***	.5	13.7 ***	-.9	.12	210
Norway	16.3	.5	.9	-6.9	-21.2	.2	2.1	-1.4	.06	210
New Zealand	12.3	-.3	-4.7	-2.5	-23.2	.2	.9	4.5	.04	210
Singapore	9.3	-1.1 *	-3.8	-10.0 **	-16.3	1.2 *	.1	10.2	.05	210
Sweden	14.2	-1.3 *	-3.7	-8.8	-27.0 **	1.0	7.5	-8.7	.09	210

2.3 Implications for Asset Pricing

Table 5 provides the ols estimates of the reaction of excess equity returns for each country portfolio. The dependent variable is the MSCI (Fama-French) value-weighted dollar excess return (e_t) and the explanatory variables are the vectors of expected (s_t^e) and unexpected (s_t^u) components of oil price and Fed policy:

$$e_t = a + B^e \overline{\Delta} s_t^e + B^u \overline{\Delta} s_t^u + \varepsilon_t \tag{3}$$

where $s = [o, i]'$ and ε_t is the error term. I also control for sample instability before and after 1994 using the interaction terms of the explanatory variables and a dummy variable equals to one for the period after February 1994 onwards.

For the U.S. equity markets, an unexpected increase of oil price by one standard deviation (1.8 dollars per barrel) causes a drop of excess equity return by 1.3 percent. An unexpected tigthening of Fed funds rate by one standard deviation (10 basis points) causes a drop of excess equity return on the order of .1 percent. The sample is stable pre- and post 1994. The movements of oil price and funds rate explain about 10 percent of the variation in U.S. equity returns. For the global equity portfolio excluding the U.S., an unexpected increase of oil price by one standard deviation causes a drop of excess equity return by 2.0 percent. The reaction of global equity returns to oil prices are different before and after 1994: post 1994 an expected increase of oil price by one standard deviation (10¢ per barrel) causes the global equity returns to drop by an extra 2 percent, while a one standard deviation of unexpected increase of oil price (1.8 dollars per barrel) lowers the overall negative effect of the oil price by 2 percent. Across regional portfolios, the reactions to oil surprise are similar, whereas the reactions to funds rate surprise are strongest for the European markets. The reactions to a one standard deviation of oil surprise (1.8 dollars per barrel) range from -1.3 percent for Netherlands to -2.7 percent for Spain. The reactions to a one standard deviation of funds rate surprise (10 basis points) range from $-.1$ percent for Germany to -1.5 percent for Denmark. To sum up the coefficient estimates in a perspective, an unexpected 1 dollar per barrel increase of oil price causes a drop on the order of .7 percent for the U.S. portfolio and 1.1 percent for the global portfolio. An unexpected 25 basis point increase of Federal funds rate causes a drop on the order of 2.5 percent for the U.S. portfolio and 1.5 percent for the global portfolio.

Are the observed reactions consistent with an asset pricing model? An international CAPM model would explain for each country all the expected returns by slopes on the world market return. Fama and French (1998) find that an international two-factor (one-state variable) ICAPM model does better than the international CAPM in explaining the high average returns on the country value portfolio. They point out that the global high and low *B/M* portfolios are two-factor multifactor-minimum-variance (MMV) portfolio, so the difference between the high- and low *B/M* portfolio returns can be the second explanatory return in a one-state-variable ICAPM. Further, the alternative measures (*E/P*, *C/P*, *D/P*) of the value-growth premium are also interchangeable as the second explanatory return. To check whether the observed reaction is proportional to the countries' betas, I first obtain country betas from a regression of excess equity return for country i, $e_{i,t}$, on the global market excess return, $e_{w,t}^{mkt}$, and the difference between returns of the global high- and low portfolios, $e_{w,t}^{h-l}$:

$$e_{i,t} = \alpha + \beta_i^1 e_{w,t}^m + \beta_i^2 e_{w,t}^{h-l} + \nu_{i,t} \tag{4}$$

Then, it follows that the country reaction implied by the two-factor ICAPM is

$$\widehat{b}_i^u = \widehat{\beta}_i^1 \left(\widehat{b}_w^m\right) + \widehat{\beta}_i^2 \left(\widehat{b}_w^{h-l}\right) \tag{5}$$

where $\widehat{b}_i^u$ is the estimated reaction of the value-weighted excess equity return of country i to the surprise (unexpected component of oil price and funds rate) implied by the two-factor ICAPM; $w \in$ {the global portfolio, regional

portfolios} denotes the world market return; $\widehat{b}_w^m$ the estimated reaction of the world market portfolio; $\widehat{b}_w^{h-l}$ the estimated reaction of the difference between returns of the world high- and low value portfolios. The calculation is done for the global equity returns using all four alternative measures of value-growth premia. For the world market return in equation (4) I try the global portfolio as well as the regional portfolios as the equity markets tend to be more highly correlated with markets in the same region (Forbes and Rigobon, 2002)

Figures 3 and 4 plot the fitted reaction to the surprise component of, respectively, oil price and Fed policy from equation (3) against the implied reaction, $\widehat{b}_i^u$, from equation (5) using the global portfolio in the top row and regional portfolios in the bottom row. To allow for a different pattern in the sample after February 1994, the left panel depicts the plot for the whole sample and the right panel for the post 1994 sample. Also plotted is the 45-degree line that the points would lie on if the two-factor ICAPM fully explained the reaction across countries. We can see that the regional-ICAPM does better in explaining the reaction to oil price shocks, while both the global-ICAPM and the regional-ICAPM do equally well for the post 1994 sample in explaining the reaction to funds rate shocks. Although the fit is not perfect, the points line up much better along the 45-degree line. The regional-ICAPM thus provides a parsimonious way to summarize the general of patterns in the reaction of global equity returns to unexpected movements of oil price. Since the economy of each region differs on its reliance on oil, the evidence highlights the role of regional similarity and *economic integration* on the reaction of equity markets to macroeconomic shocks. For the Fed policy shocks, the overall explanatory power of the two-factor (one-state-variable) ICAPM model for the post 1994 sample is consistent with the positive association between the unexpected component of the funds rate and the value premia after 1994 (Table 4). The global-ICAPM and regional-ICAPM therefore provide a parsimonious way to summarize the pattern of the equity returns' reaction to Fed policy shocks after 1994. This second piece of asset pricing evidence suggests the role of *financial friction*, as captured by the value premia on the reaction of equity markets to macroeconomic shocks.

3 Dissection

3.1 Variance and covariance decomposition of equity returns

This section delves further into possible factors driving the observed reaction of the global equity markets. In general, the innovations (movements) in current excess equity returns are associated with the revisions in expectation or news on three components: expected future dividends, future expected real interest rates used to discount those dividends, expected excess returns (i.e., the equity premium), and, in the case of holding international equities, the real exchange rates. Following the variance decomposition of Campbell and Ammer (1993), and Ammer and Mei (1996), I first dissect the innovation in the U.S. excess equity returns into news about future dividends, interest rates, and future excess returns, then use VAR to estimate proxies for revisions in expectation. The innovation in U.S. excess equity return is

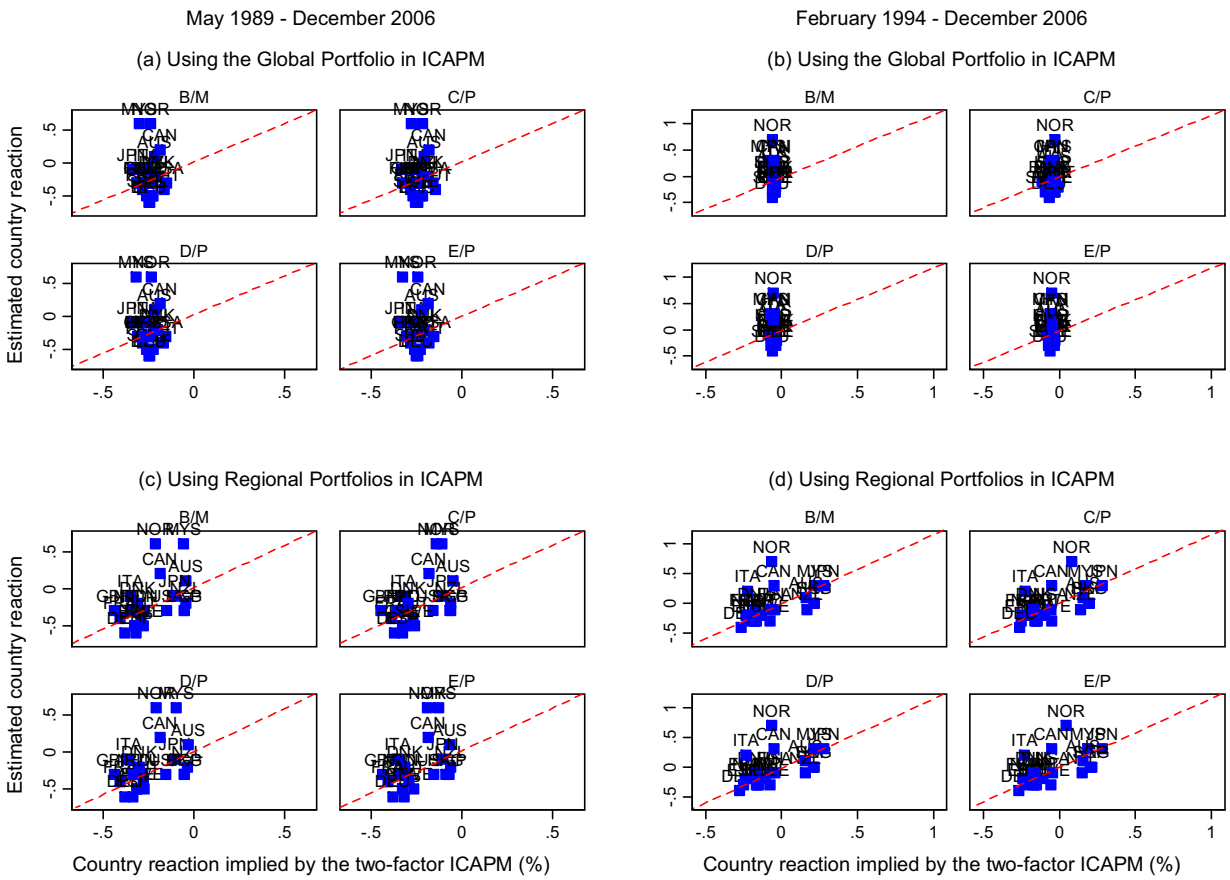
$$\widetilde{e}_{t+1} = (E_{t+1} - E_t)\left\{\sum_{j=0}^{\infty}\rho^j \Delta d_{t+1+j} - \sum_{j=0}^{\infty}\rho^j \Delta r_{t+1+j} - \sum_{j=0}^{\infty}\rho^j \Delta e_{t+1+j}\right\} \tag{6}$$

where r is the one-period Treasury bill return and d is the dividend paid. A tilde ($\tilde{}$) superscript represents an innovation in a variable, and a delta Δ denotes a first difference. E_t denotes expectation formed at the end of period t, $E_{t+1} - E_t$ is the revision in expectations given new information arrived during period $t+1$. ρ , a constant of linearization, is a steady-state ratio of the equity price to the price plus dividend; following Campbell and Ammer (1993), this is set to 0.9962. The decomposition can be rewritten as

$$\widetilde{e}_{t+1} = \widetilde{e}_{d,t+1} - \widetilde{e}_{r,t+1} - \widetilde{e}_{e,t+1} \tag{7}$$

where $\widetilde{e}_{t+1}$ is the excess equity return innovation. $\widetilde{e}_{d,t+1}$ denote news about future dividends; $\widetilde{e}_{r,t+1}$ news about

Figure 3: **Estimated reaction of country portfolios to unanticipated movement in oil price and international two-factor ICAPM implications.** All returns are monthly in dollars. The figure depicts the reaction of the MSCI country portfolios (Fama-French) to an unexpected increase of oil price by one dollar per barrel over the sample period given in the column headings. The vertical axis values are the fitted country portfolio's return reaction. The values on the horizontal axis are the country portfolio's return reaction implied by the international two-factor (one-state-variable) ICAPM using the global portfolio (top row) and the regional portfolios (bottom row). The difference between the high- and low B/M (E/P,C/P,D/P) portfolio returns is the second explanatory return in the one-state-variable ICAPM. The dash line is 45 degree.



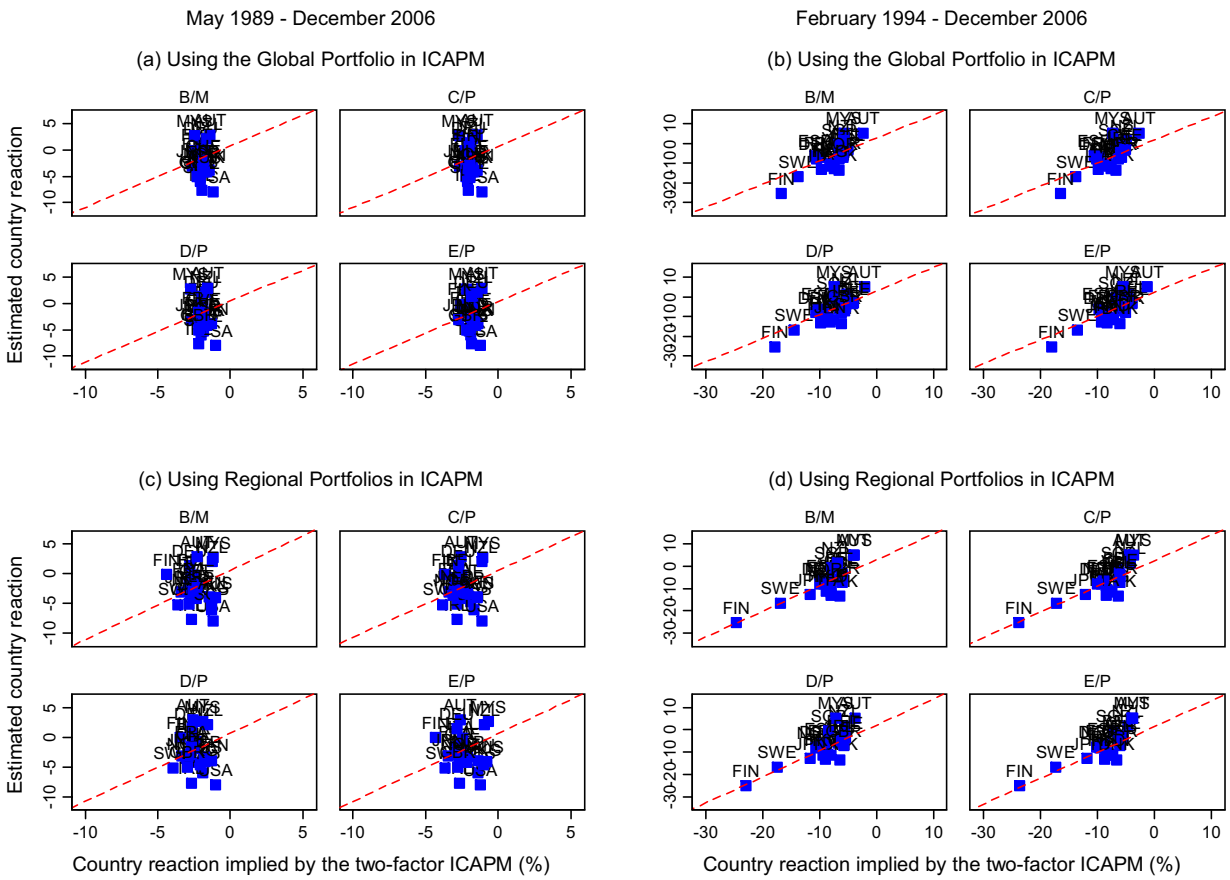
interest rates; and $\widetilde{e}_{e,t+1}$ news about expected future excess return (equity risk premia). The intuition for the signs is the following. News of smaller dividend growth, $\widetilde{e}_{d,t+1}$, will lower the current excess equity return. In contrast, news about a downward revision of expected future excess return, $\widetilde{e}_{e,t+1}$, or news about negative revisions to future real interest rate expectation, $\widetilde{e}_{r,t+1}$, will increase the current excess equity return. A corresponding international version is similar, with an addition of the real exchange rate

$$\widetilde{e}^*_{t+1} = (E_{t+1} - E_t) \left\{ \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta d^*_{t+1+j} - \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta r^*_{t+1+j} - \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta e^*_{t+1+j} \right\} \tag{8}$$

where the asterisk (*) superscripts denote international variables. The excess of the international equity return (expressed in dollars) over the U.S. Treasury bill return is

$$f_{t+1} = e^*_{t+1} - \Delta q_{t+1} + r^*_{t+1} - r_{t+1} \tag{9}$$

Figure 4: **Estimated reaction of country portfolios to unanticipated movement in Federal funds rate and international two-factor ICAPM implications.** All returns are monthly in dollars. The figure depicts the reaction of the MSCI country portfolios (Fama-French) to an unexpected increase of Federal funds rate by one hundred basis points over the sample period given in the column headings. The vertical axis values are the fitted country portfolio's return reaction. The values on the horizontal axis are the country portfolio's return reaction implied by the international two-factor (one-state-variable) ICAPM using the global portfolio (top row) and the regional portfolios (bottom row). The difference between the high- and low B/M (E/P,C/P,D/P) portfolio returns is the second explanatory return in the one-state-variable ICAPM. The dash line is 45 degree.



where f is the international excess equity return and q is the real exchange value of the local currency (an increase in q is the dollar's real appreciation against the local currency). The innovation in the international excess equity return is

$$\widetilde{f}_{t+1} = (E_{t+1} - E_t) \left\{ \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta d^*_{t+1+j} - \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta r_{t+1+j} - \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta f_{t+1+j} - \sum_{j=0}^{\infty} (\rho^*)^j \, \Delta q_{t+1+j} \right\} \tag{10}$$

which can be rewritten as

$$\widetilde{f}_{t+1} = \widetilde{f}_{d,t+1} - \widetilde{f}_{r,t+1} - \widetilde{f}_{f,t+1} - \widetilde{f}_{q,t+1} \tag{11}$$

The rationale for the signs on $\widetilde{f}_{d,t+1}$, $\widetilde{f}_{r,t+1}$, $\widetilde{f}_{f,t+1}$ is the same as those for the signs on the U.S. equation. For $\widetilde{f}_{q,t+1}$, news that the U.S. dollar will appreciate reduce the expected dollar returns on international equities. Without any revision in other components of return innovation, the current excess equity return in the international markets will have to drop, so that higher future returns can be generated from the same cash flow. Hau and Rey (2006)

find that returns on the foreign currency are negatively correlated with excess returns on foreign over U.S. equity, and positively correlated with equity flows into the foreign market. They argue that these resultant correlations of portfolio balancing (uncovered equity parity) are important to the joint determination of exchange rates, equity prices, and capital flows – this idea is not pursued here.

We can write the variance of the U.S. current excess equity return innovation as

$$\begin{aligned} var\left(\widetilde{e}\right) &= var\left(\widetilde{e}_d\right) + var\left(\widetilde{e}_r\right) + var\left(\widetilde{e}_e\right) \\ &\quad -2cov\left(\widetilde{e}_d, \widetilde{e}_r\right) - 2cov\left(\widetilde{e}_d, \widetilde{e}_e\right) + 2cov\left(\widetilde{e}_r, \widetilde{e}_e\right) \end{aligned} \tag{12}$$

The variance of the international current excess equity return innovation can be decomposed into ten components as

$$\begin{aligned} var\left(\widetilde{f}\right) &= var\left(\widetilde{f}_d\right) + var\left(\widetilde{f}_r\right) + var\left(\widetilde{f}_f\right) + var\left(\widetilde{f}_q\right) \\ &\quad -2cov\left(\widetilde{f}_d, \widetilde{f}_r\right) - 2cov\left(\widetilde{f}_d, \widetilde{f}_f\right) - 2cov\left(\widetilde{f}_d, \widetilde{f}_q\right) \\ &\quad +2cov\left(\widetilde{f}_r, \widetilde{f}_f\right) + 2cov\left(\widetilde{f}_r, \widetilde{f}_q\right) + 2cov\left(\widetilde{f}_f, \widetilde{f}_q\right) \end{aligned} \tag{13}$$

To obtain proxies for the revisions in expectations, I estimate the first-order VAR in nine variables, including:

- *Excess return on U.S. equities (e)* and *International equities (f)*: calculated as total dollar returns minus the risk-free rate (1-month U.S. Treasury bill yield); source: equity returns of the market and portfolios formed on value-growth premia from the Fama-French database.
- *U.S. real interest rates (r)*: calculated as the 1-month Treasury bill rate minus the log difference in the nonseasonally-adjusted CPI; source: CPI data from the International Financial Statistics (IFS) and Datastream.
- U.S. *real exchange rate (q)*: calculated as the log difference in the foreign currency value of U.S. dollar plus the log difference in the nonseasonally-adjusted U.S. CPI, minus the log difference in the nonseasonally-adjusted CPI; source: nominal exchange rate data from IFS. Euro currency applies to Austria, Belgium, Germany, Spain, Finland, France, Ireland, Italy, and Netherlands starting January 1999.
- *Change in the U.S. nominal interest rates (Δi)*: calculated as the change in the 3-month bill rate; source: the Federal Reserve.
- *U.S. term spread (s)*: calculated as the difference between the 10-year and 1-month U.S. Treasury yields; source: the 10-year Treasury constant maturity series from the U.S. Treasury.
- *Relative U.S. Treasury bill rate (rb)*: calculated as the 3-month bill rate minus its 12-month lagged moving average
- *U.S. equity dividend yield (dy)* and *International equity dividend yield (dy^*)*: calculated as the sum of dividends over the last twelve months divided by the current price; source: CRSP.

We can write the VAR as

$$z_{t+1} = Az_t + w_{t+1} \tag{14}$$

where z_{t+1} is $np \times 1$ vector containing the excess equity return, the real interest rate, and additional variables.

$$z = [e, f, r, q, \Delta i, s, rb, dy, dy^*]' \tag{15}$$

Let ι_1 denotes a vector whose first element is one and whose other elements are zero, so that $\iota_1' z = e$. $\iota_2 ... \iota_9$ are similarly defined. It follows that the news components of U.S. and international excess equity returns can be written as

$$\begin{array}{ll} \widetilde{e}_{t+1} = \iota_1' w_{t+1} & \widetilde{f}_{t+1} = \iota_2' w_{t+1} \\ \widetilde{e}_{e,t+1} = \iota_1' \rho A \left(I - \rho A\right)^{-1} w_{t+1} & \widetilde{f}_{f,t+1} = \iota_2' \rho^* A \left(I - \rho^* A\right)^{-1} w_{t+1} \\ \widetilde{e}_{r,t+1} = \iota_3' \left(I - \rho A\right)^{-1} w_{t+1} & \widetilde{f}_{r,t+1} = \iota_3' \left(I - \rho^* A\right)^{-1} w_{t+1} \\ \widetilde{e}_{d,t+1} = \widetilde{e}_{t+1} - \widetilde{e}_{r,t+1} - \widetilde{e}_{e,t+1} & \widetilde{f}_{q,t+1} = \iota_4' \left(1 - \rho^*\right) \left(I - \rho^* A\right)^{-1} w_{t+1} \\ & \widetilde{f}_{d,t+1} = \widetilde{f}_{t+1} - \widetilde{f}_{r,t+1} - \widetilde{f}_{f,t+1} - \widetilde{f}_{q,t+1} \end{array} \tag{16}$$

Table 6 reports the decomposition for two sample periods, before and after February 1994. The ten components (six for U.S. return news) of international excess equity return innovations are reported as a percentage of the total variance.. Similar to the previous studies, I find that the variance of equity premium (expected future excess return) accounts for most of the total variance of equity markets in the U.S. (Bernanke and Kuttner, 2005) and the U.K (Ammer and Mei, 1996). The real interest rate news contribute little and the real exchange rate news contribute nil to the current excess equity returns across the global markets and in both sub-samples: the variance of dividend news accounts for approximately 20% of the total current excess return innovation, and the variance of future excess return accounts for 50%.

To further understanding the long-term and fundamental interactions between the markets, we need to estimate the extent of economic integration between a country and the U.S. One approach is to use the gravity-instrumented methodology to extract the size of economic integration. This gravity methodology employs between countries geographic (e.g., distance, common land border, size and output similarity) and informational (e.g., telephone volume, common language, sophistication of financial markets, number of bank subsidiaries) variables to correct endogeneity issues, and therefore yields a superior measure of economic integration than the de facto measures, i.e. bilateral trade to GDP and bilateral equity flows to market capitalization. I use the gravity method to estimate the trade integration similar to that in Frankel and Romer (1999) and Frankel and Rose (2002), and the financial integration similar to that in Aviat and Coeurdacier (2007) and Portes and Rey (2005) specifically for the integration between a country and the U.S. Another approach is to use Ammer and Mei (1996)'s covariance decomposition of the comovement of innovations in excess equity returns across the markets to extract the real and financial integration between countries. Using this latter approach, the trade (real) integration is measured as the comovement between future U.S. dividend innovation, e_d, and future international dividend innovation, f_d; the financial integration is measured as the comovement between future U.S. expected return innovations, e_e, and future international expected return innovation, f_f. The covariance between a country and the U.S. can be written as

$$\begin{aligned} cov\left(\widetilde{e}, \widetilde{f}\right) \quad = \quad & cov\left(\widetilde{e}_d, \widetilde{f}_d\right) - cov\left(\widetilde{e}_d, \widetilde{f}_r\right) - cov\left(\widetilde{e}_d, \widetilde{f}_f\right) - cov\left(\widetilde{e}_d, \widetilde{f}_q\right) \\ & -cov\left(\widetilde{e}_r, \widetilde{f}_d\right) - cov\left(\widetilde{e}_r, \widetilde{f}_r\right) - cov\left(\widetilde{e}_r, \widetilde{f}_f\right) - cov\left(\widetilde{e}_r, \widetilde{f}_q\right) \\ & -cov\left(\widetilde{e}_e, \widetilde{f}_d\right) - cov\left(\widetilde{e}_e, \widetilde{f}_r\right) - cov\left(\widetilde{e}_e, \widetilde{f}_f\right) - cov\left(\widetilde{e}_e, \widetilde{f}_q\right) \end{aligned} \tag{17}$$

Table 6: **Variance decomposition of U.S. and International excess equity returns.** The table reports a variance decomposition of U.S. and international excess equity returns. All returns are monthly, in dollars. The excess equity return is the difference between the MSCI value-weighted country return (Fama-French) and the 1-month U.S. Treasury bill rate. The first-order VAR is in excess return on U.S. equities, excess return on international equities, U.S. real interest rates, real exchange rates against the U.S. dollars, change in the U.S. nominal interest rate, U.S. term spread, relative U.S. Treasury bill rate, U.S. equity dividend yield, and international equity dividend yield. Forecasts of these variables are then used to calculate excess return innovations and the components of the innovations associated with dividend growths (d), real interest rates (r), future excess returns (f), and real exchange rates (q). The components are reported as a percentage of the total variance.

	$var\,(return\ news)$					$cov\,(news1, news2)$					
Country	Total	dividends (d)	discount rates (r)	future returns (f)	exchange rates (q)	(d,r)	(d,f)	(d,q)	(r,f)	(r,q)	(f,q)
USA	20.8	26.4	.4	54.3		-.9	19.3		.6		
AUS	50.1	14.8	.1	58.4	1.E-8	-.5	26.4	2.E-4	.8	-1.E-5	4.E-4
AUT	46.0	14.7	.2	65.4	1.E-8	-.6	20.1	9.E-5	.3	-1.E-5	3.E-4
BEL	34.8	26.3	.2	39.9	2.E-8	-.9	34.4	4.E-4	.2	-1.E-5	4.E-4
CAN	32.7	18.4	.2	57.3	4.E-9	-1.0	24.1	1.E-4	.9	-1.E-5	6.E-5
CHE	30.0	19.2	.2	53.1	3.E-8	-1.0	29.0	5.E-4	-.5	-1.E-5	6.E-4
DEU	41.6	20.2	.2	51.3	2.E-8	-1.0	29.6	2.E-4	-.2	-1.E-5	5.E-4
DNK	33.7	16.9	.3	61.8	2.E-8	-1.2	22.4	2.E-4	-.2	-8.E-6	5.E-4
ESP	53.8	33.3	.1	37.3	1.E-8	-.9	30.3	3.E-4	-.2	-1.E-5	2.E-4
FIN	93.7	29.1	.1	42.6	8.E-9	-.5	29.2	3.E-5	-.5	-5.E-6	2.E-4
FRA	51.9	24.7	.1	42.7	1.E-8	-.7	33.2	2.E-4	-.1	-1.E-5	3.E-4
GBR	32.1	16.5	.2	59.2	2.E-8	-.5	24.0	2.E-4	.5	-1.E-5	3.E-4
HKG	98.0	19.5	.1	48.9	1.E-9	.0	30.9	1.E-5	.6	-5.E-6	6.E-7
IRL	31.5	13.6	.3	70.4	1.E-8	-.9	16.7	2.E-4	-.1	-3.E-5	3.E-4
ITA	62.7	23.4	.1	52.8	1.E-8	-.8	24.6	2.E-4	.0	-1.E-5	3.E-4
JPN	47.7	24.9	.2	47.7	2.E-8	-.4	27.4	5.E-4	.2	2.E-6	5.E-4
MYS	138.2	23.3	.0	43.1	6.E-9	-.2	33.8	2.E-4	.0	-9.E-8	3.E-4
NLD	31.3	21.7	.2	50.6	3.E-8	-.9	27.8	6.E-5	.6	-9.E-6	4.E-4
NOR	66.6	20.7	.1	48.7	9.E-9	-.3	30.4	9.E-5	.4	-4.E-6	3.E-4
NZL	50.5	19.7	.2	47.1	1.E-8	-1.1	33.8	3.E-4	.3	-2.E-5	4.E-4
SGP	63.3	16.2	.1	50.9	3.E-9	-.1	32.2	1.E-4	.7	-8.E-6	2.E-4
SWE	55.3	26.4	.1	45.2	1.E-8	-.7	29.1	2.E-4	-.1	-5.E-6	4.E-4

To estimate the economic integration, I include countries with all four measures of trade and financial integration: Australia, Switzerland, Germany, Spain, France, United Kingdom, Hong Kong, Italy, Japan, Netherlands, Singapore, Sweden. Table 7 reports the correlations between the four alternative measures (the Appendix provides in details the covariance linkages and the correlations linkages). Using the monthly sample spanning 1957-1989, Ammer and Mei (1996) find that news about future dividend growth does a better job than contemporaneous output correlation at capturing international transmission of economic shocks. Using a more recent sample, the country-level information in Tables 8 and 9 indicate that the largest contributions come from the comovements of news about future dividend growth (trade integration) and comovements of news about future excess returns (financial integration). Correlations between the future excess return news are mostly above 60% while those of the dividend news are slightly lower. The interest rate news and real exchange rate news contribute relatively little to covariances and correlations of equity returns between the U.S. and other global equity markets. However, the covariance linkages differ markedly from the gravity-instrumented integration. We can see from Table 7 that the correlation between the covariance trade linkage and the correlation trade linkage is positive and large (.86), whereas the correlations between the covariance trade linkage and the gravity-instrumented trade integration is negative ($-.35$). For financial integration, the correlation between the covariance financial linkage and the correlation financial linkage is positive and large (.38), whereas the correlations between the covariance financial linkage and the gravity-instrumented financial integration is negative ($-.24$).

From Table 7, between the trade and financial integration the correlation is positive and small for the covariance linkages (.05), whereas the correlation is positive and large for the gravity method (.77). By and large, the gravity-instrumented integration in the present sample is consistent with the evidence of a positive association between capital market integration and industrial production's specialization in Kalemli-Ozcan et al. (2003), and that market size and segmentation matter to risk diversification and trade in financial assets (Martin and Rey, 2004). Financial integration, and the resultant risk diversification, allows for the intra-industry trade and trades in intermediate inputs, which account for the majority of international trade flows between countries. The estimates of trade and financial integration therefore provide useful information at the long-term and fundamental levels to examine the forces that drive the reaction of global equity markets to the oil price and Fed policy shocks.

Table 7: **Sample Correlations of Economic Integration.** The table reports correlations between four alternative measures of economic integration. The sample includes countries with all four measures of trade and financial integration: Australia, Switzerland, Germany, Spain, France, United Kingdom, Hong Kong, Italy, Japan, Netherlands, Singapore, Sweden. The covariance trade (real) linkage is the comovement between future U.S. dividend innovation, e_d, and future international dividend innovation, f_d; the covariance financial linkage is the comovement between future U.S. expected return innovations, e_e, and future international expected return innovation, f_f. The de facto trade integration is bilateral trade flows to GDP. The de facto financial integration is bilateral equity flows to market capitalization. The gravity-method trade integration is bilateral trade flows to GDP, instrumented by distance, similarity of population size and land area, common language, common land border, and landlocked indicator. The gravity-method financial integration is bilater equity flows to market capitalization, instrumented by sophistication of financial markets, distance, telephone volume, number of bank subsidiaries, and the degree of insider trading.

Economic Integration		...(a)	...(b)	...(c)	...(d)	...(e)	...(f)	...(g)
Covariance Linkages:	Trade ...(a)	1.00						
	Finance ...(b)	.05						
Correlation Linkages:	Trade ...(c)	.86	.02					
	Finance ...(d)	.43	.38	.72				
De Facto Measure:	Trade ...(e)	-.68	-.51	-.61	-.54			
	Finance ...(f)	.32	.48	.37	.65	-.43		
Gravity-Instrumented Methodology:	Trade ...(g)	-.35	-.47	-.16	-.13	.54	.02	
	Finance ...(h)	-.09	-.24	.25	.33	.31	.21	.77

3.2 Measuring the Reaction to Oil Price and Fed Policy Shocks

3.2.1 Dynamic reaction to the shocks

If we include as exogenous variable the unexpected component ($\overline{\Delta} s^u$) of oil price and Federal funds rate, then the first-order VAR is

$$z_{t+1} = Az_t + \phi \overline{\Delta} s^u_{t+1} + w^{\perp}_{t+1} \tag{18}$$

where ϕ is an $n \times 1$ vector representing the contemporaneous reaction of the elements of z_{t+1} to the change period $t+1$. The new disturbance term $w^{\perp}_{t+1}$ is orthogonal to the oil and funds rate surprises. This equation breaks the VAR's 1-month-ahead forecast error into a component capturing news about oil price and Fed policy, $\phi \overline{\Delta} s^u_{t+1}$, and a component incorporating information about factors other than the oil price and Fed policy change. Following Bernanke and Kuttner (2005), I use a two-step procedure to obtain the VAR parameters A and then regress the VAR one-step forecast errors on the unexpected component of oil price , $\overline{\Delta} o^u$, and Federal Funds rate, $\overline{\Delta} i^u$. This procedure allows for the estimation of VAR dynamics over a sample longer than the period for which the data on the oil price and Fed policy shocks are available. I use the estimated ϕ of the post 1994 sub-sample to minimize the possibility of contemporaneous response of the Federal funds rate surprises to other macroeconomic news.

Figure 5 depicts for each market the dynamic reaction of each country excess equity return to an unexpected increase of the oil price by one dollar per barrel in solid line and of the Federal funds rate by one hundred basis points in dash line. The Appendix also provides the corresponding reaction of dividend-price ratios, which rise as a result of the fall in stock prices. For the reaction of excess equity returns to oil price shocks of the large markets, the initial drop on the order of $.05\% - 2\%$ in Germany and the U.K. is followed by two months of roughly $.5\% - 1\%$ of positive returns, and subsequently months of near zero excess returns in Germany and almost 2% in the U.K. The reaction of the U.S. and Japanese markets are positive, with the initial rise on the order of $1\% - 3\%$, followed by a month of negative return, and subsequently months of near one percent excess returns. The initial reaction of the European markets ranges from $-.2\%$ of Belgium to $+.4\%$ of Canada, with the returns in subsequent months roughly $+.1\%$. For other countries, the initial reaction ranges from $-.3\%$ of New Zealand to $+.8\%$ of Malaysia, with the returns in subsequent months ranging from $-.2\%$ of New Zealand to $+.2\%$ of Finland.

For the reaction to Fed policy shocks of the large markets, the initial drop on the order of $8 - 10\%$ in the U.S., Germany, and Japan is followed by a month of roughly 5% of positive returns, and subsequently months of near zero excess returns. The reaction of the U.K. market is smaller and more gradual, with the initial drop on the order of 2%, followed by two months of positive 2% returns, and subsequently months of near two percent excess returns. The initial reaction of the European markets ranges from -20% of Italy to $+3\%$ of Switzerland, with the returns in subsequent months ranging from -12% of Italy to $+2\%$ of Ireland. For other countries, the initial reaction ranges from -20% of Sweden to $+5\%$ of Singapore, with the returns in subsequent months ranging from -16% of Sweden to $+2\%$ of Austria.

3.2.2 Reaction of dividends, discount rates, and expected future returns

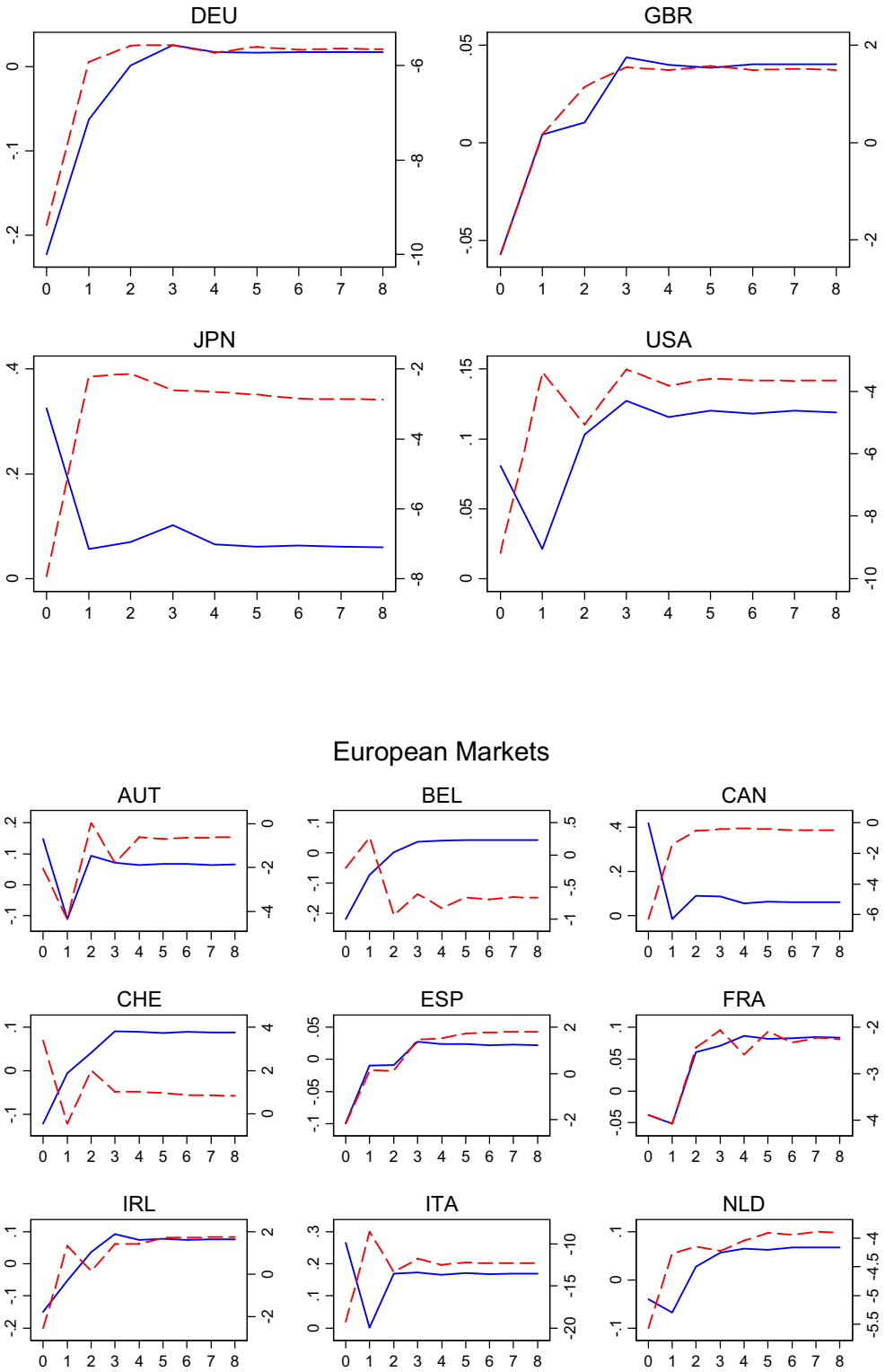
U.S. excess equity returns We can write the U.S. excess return innovation in terms of the VAR coefficients

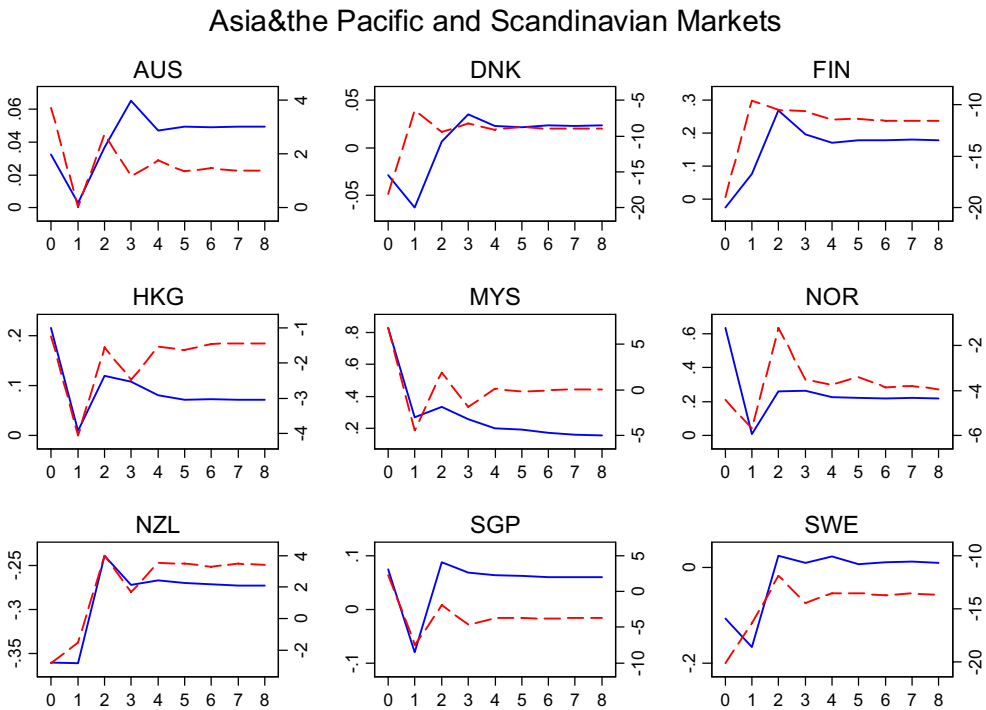
$$\begin{aligned} \widetilde{e}_{e,t+1} &= \iota_1' \rho A \left(I - \rho A\right)^{-1} w_{t+1} \\ &= \iota_1' \rho A \left(I - \rho A\right)^{-1} \left(\phi \overline{\Delta} s^u_{t+1} + w^{\perp}_{t+1}\right) \end{aligned} \tag{19}$$

The reaction of the present value of expected future excess returns to the oil price and Fed policy shocks is

$$\iota_1' \rho A \left(I - \rho A\right)^{-1} \phi \tag{20}$$

Figure 5: **Dynamic reaction of excess equity returns to oil price and Fed policy shocks.** Each panel reports dynamic responses of the country's excess returns to an unexpected increase of the oil price by one dollar per barrel in solid line and of the Federal funds rate by one hundred basis points in dash line. The contemporaneous responses to the oil price and funds rate are estimated on the February 1994-December 2006 sub-sample. A nine-variable first-order VAR, estimated over the January 1977-December 2006 sample, is used to project the future path of each country's excess equity returns.





with the reaction of the present value of current and expected future real interest returns:

$$\iota_3' \left(I - \rho A\right)^{-1} \phi \tag{21}$$

and the implied reaction of the present value of current and expected future dividends:

$$\iota_1' \phi + \iota_1' \rho A \left(I - \rho A\right)^{-1} \phi + \iota_3' \left(I - \rho A\right)^{-1} \phi = \left(\iota_1' + \iota_3'\right) \left(I - \rho A\right)^{-1} \phi \tag{22}$$

International excess equity returns Similarly, for the international excess returns

$$\begin{aligned} \widetilde{f}_{f,t+1} &= \iota_2' \rho^* A \left(I - \rho^* A\right)^{-1} w_{t+1} \\ &= \iota_2' \rho^* A \left(I - \rho^* A\right)^{-1} \left(\phi \overline{\Delta} s_{t+1}^u + w_{t+1}^{\perp}\right) \end{aligned} \tag{23}$$

with the reaction of the present value of expected future excess returns:

$$\iota_2' \rho^* A \left(I - \rho^* A\right)^{-1} \phi \tag{24}$$

the reaction of the present value of current and expected future real interest returns:

$$\iota_3' \left(I - \rho^* A\right)^{-1} \phi \tag{25}$$

the reaction of the present value of current and expected future real exchange rate returns:

$$\iota_4' \left(1 - \rho^*\right) \left(I - \rho^* A\right)^{-1} \phi \tag{26}$$

Table 8: **The reaction of revisions in expectation (news) of dividends, real interest rates, and future excess returns.** The table reports the impact of oil price shock (one dollar per barrel) and Federal Reserve policy shock (one hundred basis points) on the current U.S. and international excess equity returns, the discounted sums of current and future dividends (d), current and future real interest rates (r), and future excess stock returns (e) news. The nine-variable first-order VAR used to constructed real interest rate and excess equity return forecasts is estimated over the entire sample of January 1977 to December 2006, and the contemporaneous reaction to the oil price and Federal funds rate surprises is estimated on February 1994 to December 2006 sub-sample. The reaction of each component is reported as a percentage of the reaction of excess equity return's total variance.

	Reaction to Oil Price Shocks				Reaction to Federal Reserve Policy Shocks			
	Current excess return	*Proportion of*			Current excess return	*Proportion of*		
		d	r	e		d	r	e
United States	.05	-.27	.55	.18	-9.02	-.62	.03	.34
Australia	.15	-.25	.22	.53	-2.05	-.68	.19	.13
Austria	.03	-1.66	1.16	-1.82	3.72	-.20	-.05	.84
Belgium	-.22	-.76	-.15	.39	-.20	.68	1.53	.16
Canada	.42	-.31	.09	.59	-6.30	-.34	.06	.60
Switzerland	-.12	-.38	-.26	.88	3.38	-.56	-.10	.53
Germany	-.22	-.55	-.16	.61	-9.38	-.69	.03	.28
Denmark	-.03	-.96	-1.43	1.48	-18.04	-.57	.01	.42
Spain	-.10	-.98	-.40	.42	-2.17	-.14	.17	.69
Finland	-.03	2.94	-1.63	5.56	-18.95	-.69	.01	.30
France	-.04	-.15	-.87	1.73	-3.89	-.60	.08	.32
United Kingdom	-.06	-.60	-.56	.96	-2.30	.12	.15	.97
Hong Kong	.21	-.17	.17	.66	-1.24	-2.33	.18	-1.50
Ireland	-.15	.03	-.29	1.32	-2.52	.75	.09	1.66
Italy	.27	-.64	.14	.23	-19.25	-.69	.02	.29
Japan	.33	-.26	.10	.64	-7.94	-.36	.05	.59
Malaysia	.83	-.23	.03	.74	6.80	-.08	-.08	1.01
Netherlands	-.04	-.70	-.79	1.09	-5.56	-.68	.06	.26
Norway	.63	-.48	.06	.46	-4.42	-.70	.09	.21
New Zealand	-.36	-.86	-.11	.25	-2.82	.17	.06	1.12
Singapore	.07	-.06	.45	.49	2.24	1.12	-.11	2.23
Sweden	-.11	-.42	-.33	.91	-20.10	-.74	.02	.24

and the implied reaction of the present value of current and expected future dividends:

$$\left[\iota_2' + \iota_3' + \iota_4' \left(1 - \rho^*\right)\right] \left(I - \rho A\right)^{-1} \phi \tag{27}$$

Table 8 provides the estimation results for each country portfolios. For the U.S. markets, the reaction of equity returns to oil price shocks can be accounted for by the impact of these shocks on dividends 27%, real interest rates 55%, and expected future returns 18%. This finding differs from Jones and Kaul (1996) where the impact on dividends accounts for most of the reaction of U.S. equity returns. The reaction of equity returns to funds rate shocks can be accounted for by the impact of these shocks on dividends 62%, real interest rates 3%, and expected future returns 34%. This finding differs from Bernanke and Kuttner (2005) where the impact on expected future excess returns accounts for 50% of the reaction of U.S. equity returns.

For the reaction of other global equity markets to the oil price shocks, the general patterns are different from those of the U.S. estimates. For Austria, Denmark, Finland, France, Ireland, and Netherlands, innovations in the oil price appear to cause smaller changes in equity returns than can be justified by subsequent changes in dividends, real interest rates, or expected future returns. For the rest of the markets, the contribution of the impact on dividends ranges from -98% for Spain to -6% for Singapore. For major markets in Europe, the impact on dividends account

for 55% for Germany and 60% for the U.K. For the major markets in Asia, the impact on dividends account for 25% for Australia and 26% for Japan.

On the reaction of other global equity markets to the funds rate shocks, the general patterns are also different from those of the U.S. estimates. For Belgium, Hong Kong, Ireland, New Zealand, and Singapore, innovations in the funds rate appear to cause smaller changes in equity returns than can be justified by subsequent changes in dividends, real interest rates, or expected future returns. For the rest of the markets, the contribution of the impact on dividends ranges from +12% for U.K. to −74% for Sweden. For major markets in Europe, the impact on dividends account for 69% for Germany and 60% for the France. For the major markets in Asia, the impact on dividends account for 68% for Australia and 36% for Japan.

To sum up the results, the reaction of each country portfolios displays a wide variation on the impact of oil price and funds rate shocks on the revisions in expectation of dividends, real interest rates, and expected future returns. This variation helps resolving a puzzling stylized fact in the literature that the higher the trade and financial integration, the higher correlation of equity returns between national markets (Aviat and Coeurdacier, 2006; Forbes and Chinn, 2004; Imbs, 2004). Due to the endogeneity between the economic integration and the correlation of equity markets, it has so far been difficult to gauge the extent of risk diversification in the data. The evidence that the U.S. and other country portfolios react to the oil price and funds rate shocks by a much varying degree is supportive to the notion that international portfolio investment offers diversification benefits. In the present context, the U.S. investors respond to unexpected movements of oil price and Federal funds rate by rebalancing their global equity porfolios, thereby generating simultaneous buying and selling in the global equity markets, and the resultant two-way international capital flows.

3.3 Possible Explanations: Economic Integration and Financial Friction

What economic mechasim causes the dispersion on the impact of oil price and funds rate shocks on the revisions in expectation of dividends, real interest rates, and expected future returns? The asset pricing exercise in section 2 points to the explanatory power of economic integration and value premia, a proxy for financial friction, on the general patterns in the reaction of global equity markets to the oil price and Fed policy shocks. Figure 6 plots on the vertical axis the impact of oil price shocks (top row) and funds rate shocks (bottom row) on the return news on the horizontal axis the economic integration between a country and the U.S. using the gravity-instrumented trade share (left panel) and financial share (right panel). For the oil price shocks, the impacts on current excess equity returns and dividends news tend to decrease with trade and financial integration, whereas the opposite applies to the real interest rate and the expected future returns news. For the funds rate shocks, the impacts on current excess returns and dividends news tend to increase with trade and financial integration. The impacts of real interest rate and expected future returns increase with trade integration, but decrease with financial integration.

To quantify how economic integration and financial friction drive the patterns, I report in Table 9 the regressions of the impacts as dependent variables on the measures of trade and financial integration, including a dummy variable for the value (high book to market) and for the growth (low book to market) portfolios as a proxy for financial friction. The estimation is done for the impacts on current excess returns, dividend news, discount rate news, and future return news, using all four alternative measures of economic integration: the gravity method, the de facto measure, the covariance linkages, and the correlation linkages. For the impacts of the oil price shocks, the gravity trade (financial) integration increases (decreases) the impacts on current returns and dividend news, and vice versa for the impacts on discount rate and future return news. A one-percentage point increase of trade integration between a country and the U.S. raises the impact on current excess returns by .11 percent and dividend news by .04 percent, whereas it lowers the impact on discount rate news by −.10 percent and future return news by −.06 percent. A one-percentage point increase of financial integration lowers the impact on current excess returns by −.17 percent, whereas it raises the impact on discount rate news by .35 percent and future return news by .11 percent.

On the impacts of the funds rate shocks, the gravity trade (financial) integration decreases (increases) the impacts on current returns and dividend news, and vice versa for the impacts on discount rate and future return news. A one-percentage point increase of trade integration between a country and the U.S. lowers the impact on current excess returns by -4.56 percent and dividend news by -2.59 percent, whereas it raises the impact on future return news by 1.97 percent. A one-percentage point increase of financial integration raises the impact on current excess returns by 10.90 percent and dividend news by 7.57 percent, whereas it lowers the impact on discount rate news by -2.74 percent and future return news by -3.30 percent.

Comparing across the four alternative measures of economic integration, the coefficient estimates from the regressions using the gravity-instrumented integration are similar and sharper than those from the regressions using the de facto measures. Using economic integration of the gravity method yields the similar results for the impacts of funds rate shocks, but the opposite for the impacts of the oil price shocks. Since an unexpected movement of the oil price is a world-wide event, the reaction of global equity returns are more correlated than the reaction to the funds rate shocks (Table 1). Therefore, the gravity-instrumented integration should be more exogenous to the error term in the regression relative to the economic integration measured by covariance and correlation linkages.

The impact of the oil price shocks is lower on the value portfolios for the current excess returns ($-.12$ percent) and dividend news ($-.10$ percent). An unexpected oil price increase may in general increase the outlook for world-wide economic boom, and thus a higher demand for growth portfolios. The impact of the funds rate shocks on the discount rate news for the value portfolios is larger (6.69 percent), an evidence supportive to the hypothesis that financial friction is associated with a higher reaction of equity returns. This finding is robust to other measures of value, including E/P, C/P, and D/P (the Appendix provides the robustness check). Overall, the estimation using economic integration and financial friction explains about 30 percent of empirical variation in the impacts of oil price and Fed policy shocks.

These findings draw on at least two strands of recent empirical studies on the global equity markets and economic integration. Hausman and Wongswan (2006) find that a cross-country variation in the equity market response to FOMC announcement is strongly related to the percentage of each country's equity market capitalization owned by U.S. investors. Lane and Milesi-Ferretti (forthcoming) find in a cross-country data as of of 2001 that larger bilateral financial positions are associated with more correlated stockmarket returns. The findings in this paper are also related to Guidolin and Timmermann (forthcoming-b) where the presence of regimes in the return distribution is leading to a large increase in the U.S. investor's optimal holdings of U.S. stocks, and thus an explanation of the strong home bias observed in U.S. investors' asset allocation. This paper goes beyond the literature by considering jointly the effects of oil price and Fed policy shocks, as well as highlighting the caveat of using the gravity-instrumented economic integration versus the de facto and correlation measures. There are also some evidence that monetary union increases to the integration of both equity and bond markets (Kim et al. 2005, 2006). In addition di Giovanni et al. (forthcoming) report that competition among policymakers in European countries result in the OLS estimates bias downward the estimated impact of monetary policy on real output growth; using the Germany's interest rates as an instrument for interest rates of other European countries, the difference between the OLS and the IV estimates is decreasing with respect to the distance and trade between a country and Germany.

Figure 6: **The role of trade and financial integration on the global equity markets' reactions.** Each panel depicts on the vertical axis the reaction of the indicated return revisions to an unexpected increase of oil price and Federal funds rate surprises. The horizontal axis values are the gravity -instrumented integration between a country and the U.S. The gravity-method trade integration is bilateral trade flows to GDP, instrumented by distance, similarity of population size and land area, common language, common land border, and landlocked indicator. The gravity-method financial integration is bilater equity flows to market capitalization, instrumented by sophistication of financial markets, distance, telephone volume, number of bank subsidiaries, and the degree of insider trading. The sample is January 1977-December 2006.

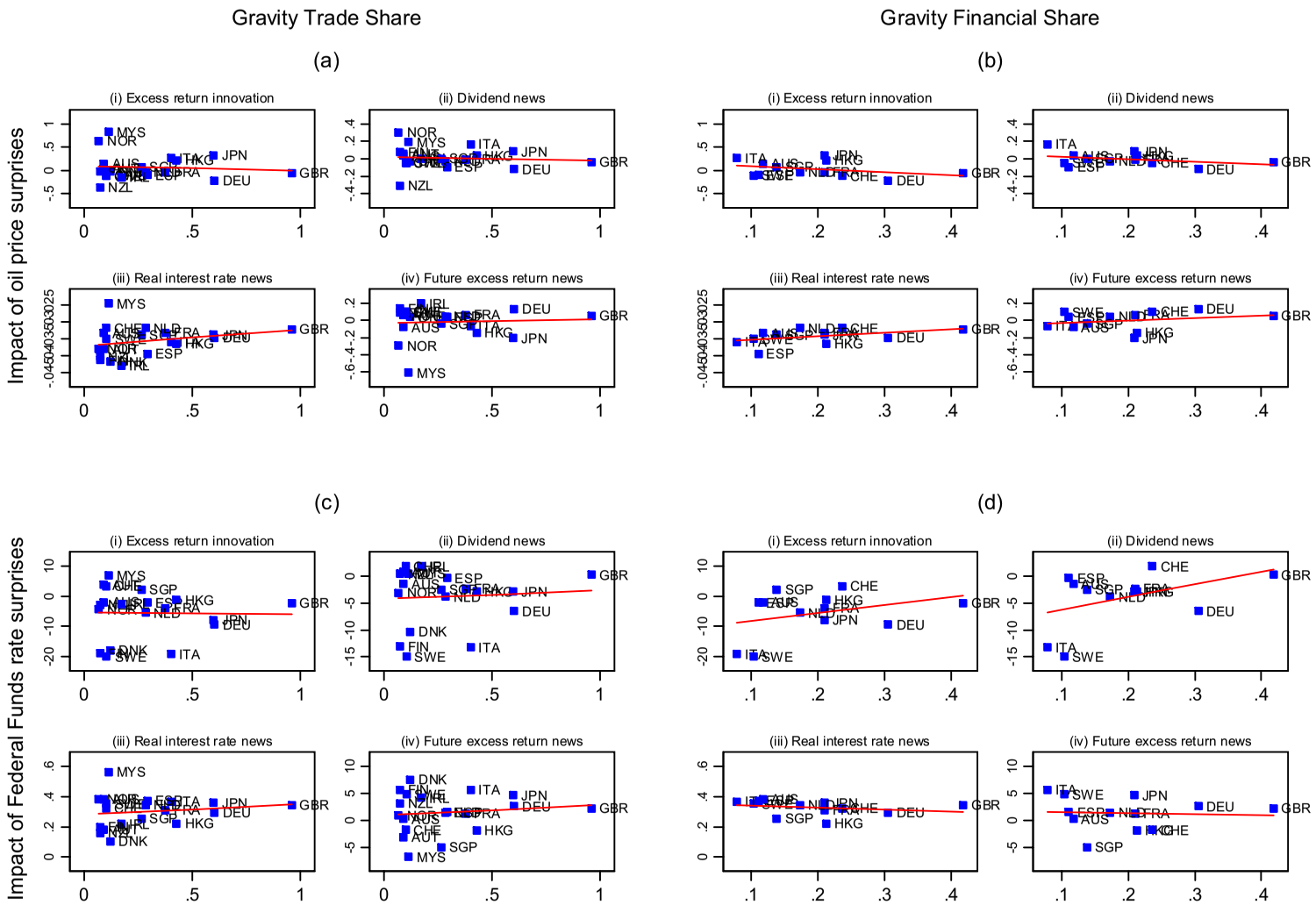


Table 9: **Explaining the reaction of global equity markets to oil price and Federal Reserve policy shocks.** The table reports coefficient estimates from the regressions of the impact of oil price and Funds rate shocks on the excess equity return, the discounted sums of current and future dividends, current and future real interest rates, and future excess equity returns news. The covariance trade (real) linkage is the comovement between future U.S. dividend innovation, e_d, and future international dividend innovation, f_d; the covariance financial linkage is the comovement between future U.S. expected return innovations, e_e, and future international expected return innovation, f_f. The de facto trade integration is bilateral trade flows to GDP. The de facto financial integration is bilateral equity flows to market capitalization. The gravity-method trade integration is bilateral trade flows to GDP, instrumented by distance, similarity of population size and land area, common language, common land border, and landlocked indicator. The gravity-method financial integration is bilater equity flows to market capitalization, instrumented by sophistication of financial markets, distance, telephone volume, number of bank subsidiaries, and the degree of insider trading. The regressions pool the market, high book to market value portfolio (B/M), and low B/M portfolios of all countries. The value (growth) portfolio is a dummy variable. The regressions also include an intercept, whose estimates are not reported. The heteroscedasticity robust standard errors are in the bracket. *(**,***) signifies statistically significant at 10(5,1) percent level. The sample spans January 1977 - December 2006, and includes countries with all four measures of trade and financial integration: Australia, Switzerland, Germany, Spain, France, United Kingdom, Hong Kong, Italy, Japan, Netherlands, Singapore, Sweden.

	Gravity Method				De Facto Measure				Covariance Linkages				Correlation Linkages			
	Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate	
Impacts on current excess return innovation																
Trade integration	.11	[.03]***	-4.56	[1.55]***	.06	[.04]	1.22	[1.93]	-.07	[.02]***	.34	[1.05]	-1.06	[.34]***	-11.85	[15.44]
Financial integration	-.17	[.06]***	10.90	[2.35]***	-.07	[.06]	3.73	[2.95]	.00	[.01]	.77	[0.62]	-.09	[.52]	47.03	[19.31]**
Growth portfolio	.04	[.07]	-.20	[2.89]	.04	[.07]	-.20	[3.31]	.04	[.06]	-.20	[3.24]	.04	[.05]	-.20	[3.10]
Value portfolio	-.12	[.07]*	-2.98	[3.13]	-.12	[.07]*	-2.98	[3.62]	-.12	[.06]**	-2.98	[3.69]	-.12	[.05]**	-2.98	[3.51]
R^2	.31		.29		.32		.07		.41		.06		.60		.15	
Impacts on dividend news																
Trade integration	.04	[.02]**	-2.59	[1.15]**	.03	[.03]	1.27	[1.49]	-.02	[.01]**	-.11	[0.80]	-.36	[.25]	-7.86	[12.10]
Financial integration	-.05	[.04]	7.57	[1.71]***	-.02	[.04]	1.42	[2.12]	-.01	[.01]	-.05	[0.44]	.03	[.37]	25.31	[14.45]*
Growth portfolio	.02	[.04]	-.04	[1.95]	.02	[.04]	-.04	[2.30]	.02	[.03]	-.04	[2.27]	.02	[.03]	-.04	[2.17]
Value portfolio	-.10	[.04]**	-1.27	[2.21]	-.10	[.04]**	-1.27	[2.54]	-.10	[.04]**	-1.27	[2.62]	-.10	[.04]**	-1.27	[2.55]
R^2	.31		.27		.34		.03		.36		.01		.38		.08	
Impacts on discount rate news																
Trade integration	-.10	[.02]***	-.49	[1.02]	.11	[.05]**	-1.92	[1.21]	-.02	[.02]	-.88	[0.52]*	-.63	[.40]	-11.72	[11.79]
Financial integration	.35	[.05]***	-2.74	[1.29]**	.11	[.06]*	-4.02	[1.96]**	.00	[.02]	-.62	[0.52]	1.93	[.51]***	8.11	[17.07]
Growth portfolio	.02	[.06]	.53	[1.91]	.02	[.08]	.53	[1.82]	.02	[.09]	.53	[1.82]	.02	[.07]	.53	[2.01]
Value portfolio	.06	[.06]	6.69	[1.98]***	.06	[.08]	6.69	[1.90]***	.06	[.08]	6.69	[1.93]***	.06	[.07]	6.69	[2.05]***
R^2	.54		.37		.18		.41		.04		.40		.38		.33	
Impacts on future excess return news																
Trade integration	-.06	[.02]***	1.97	[0.50]***	-.03	[.02]	.07	[0.58]	.04	[.01]***	-.44	[0.27]	.70	[.13]***	4.11	[4.88]
Financial integration	.11	[.03]***	-3.30	[0.78]***	.05	[.03]	-2.27	[1.11]*	.00	[.01]	-.81	[0.22]***	.10	[.19]	-21.80	[8.04]**
Growth portfolio	-.02	[.04]	.16	[1.24]	-.02	[.04]	.16	[1.23]	-.02	[.04]	.16	[1.09]	-.02	[.03]	.16	[1.22]
Value portfolio	.02	[.04]	1.64	[1.22]	.02	[.04]	1.64	[1.28]	.02	[.03]	1.64	[1.17]	.02	[.02]	1.64	[1.23]
R^2	.24		.25		.22		.20		.39		.33		.72		.25	

4 Concluding Remarks

If the global equity markets simply fall in response to the oil price and Fed policy shocks, then the shocks must have large positive correlation with the U.S. investors' gross purchases and large negative correlation with gross sales. Yet, looking at 30 years of data, the Federal funds rate surprises are associated with simultaneously buying and selling of the U.S. investors in international markets (Table 1). The association indicates portfolio re-balancing. This paper systematically reports the reaction of global equity markets and provides evidence that economic integration and financial friction have explanatory power on cross-country patterns of the reaction.

The analysis has covered only the equity markets of developed economies. While these markets make up for most of the global market capitalization, it will be useful to extract similar information from the emerging-markets sample. Although the oil price and Fed policy shocks are two major sources of economic fluctuations, there are also several others. For example, given the money neutrality in the long run, what is the role of fiscal policy of a large country on the global equity markets? Santa-Clara and Valkanov (2003) argue that a puzzling higher return in the U.S. markets on the order of 9% under Democratic presidencies is attributable to fiscal policy. An empirical challenge is data because even a well-constructed measure of U.S. fiscal policy shocks in Romer and Romer (2007) have less than 40 events since 1947. Future works may also examine investor- or fund-level data, using both classical and Bayesian econometrics (Hollifield et al., 2003). Gabaix et al. (2006) shows how excess equity market volatility can be generated from trades by very large institutional investors in relatively illiquid markets. Given the majority of equity market participants are institutional investors, what explains the reaction of institutional trading to oil price and Fed policy shocks?

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Appendix: Sample composition. The table reports sample period for each country portfolio, country market capitalization (percent of world capitalization) and U.S. holdings (percent of country market capitalization) at the beginning of 2006. Also reported below are p-values of the Dickey-Fuller unit-root tests for a corresponding period on the nine variables used to construct the VAR. The nine variables are excess return on U.S. stocks (e), excess return on international stocks (f), U.S. real interest rates (r), real exchange rates against the U.S. (q), change in the U.S. nominal interest rate (Δi), U.S. term spread (s), relative U.S. Treasury bill rate (rb), U.S. dividend yield (dy), and international stock dividend yield (dy^*).

Country	Code	Region	Begin	End	%World cap.	%U.S. holdings	e	f	r	q	Δi	s	rb	dy	dy^*
Australia	AUS	ASIA	1977m1	2006m12	1.84	8.85	.00	.00	.00	.01	.00	.69	.00	.76	.00
Austria	AUT	EURO	1987m3	2006m12	.29	8.49	.00	.00	.00	.00	.00	.47	.01	.76	.03
Belgium	BEL	EURO	1977m1	2006m12	.75	6.10	.00	.00	.00	.00	.00	.69	.00	.76	.57
Canada	CAN		1977m3	2006m12	3.39	16.73	.00	.00	.00	.00	.00	.69	.00	.73	.14
Switzerland	CHE	EURO	1977m1	2006m12	2.15	20.44	.00	.00	.00	.00	.00	.69	.00	.76	.21
Germany	DEU	EURO	1977m1	2006m12	2.80	12.94	.00	.00	.00	.00	.00	.69	.00	.76	.33
Denmark	DNK	EURO	1989m3	2006m12	.41	8.79	.00	.00	.00	.00	.00	.24	.03	.23	.00
Spain	ESP	EURO	1977m1	2006m12	2.20	6.62	.00	.00	.00	.00	.00	.69	.00	.76	.47
Finland	FIN	SCAN	1988m3	2006m12	.48	21.19	.00	.00	.00	.00	.00	.30	.01	.32	.34
France	FRA	EURO	1977m1	2006m12	3.92	11.99	.00	.00	.00	.00	.00	.69	.00	.76	.13
United Kingdom	GBR	EURO	1977m1	2006m12	7.01	17.59	.00	.00	.00	.00	.00	.69	.00	.76	.39
Hong Kong	HKG	ASIA	1977m1	2006m12	2.31	4.42	.00	.00	.00	.00	.00	.69	.00	.76	.03
Ireland	IRL	EURO	1991m3	2006m12	.26	28.94	.00	.00	.00	.00	.00	.20	.05	.10	.05
Italy	ITA	EURO	1977m1	2006m12	1.83	8.01	.00	.00	.00	.00	.00	.69	.00	.76	.03
Japan	JPN	ASIA	1977m1	2006m12	10.85	10.42	.00	.00	.00	.00	.00	.69	.00	.76	.19
Malaysia	MYS	ASIA	1994m3	2001m10	.42	3.83	.00	.00	.00	.00	.18	.41	.61	.34	.39
Netherlands	NLD	EURO	1977m1	2006m12	1.67	18.25	.00	.00	.00	.00	.00	.69	.00	.76	.57
Norway	NOR	SCAN	1977m1	2006m12	.44	11.53	.00	.00	.00	.00	.00	.69	.00	.76	.05
New Zealand	NZL	ASIA	1988m3	2006m12	.09	11.41	.00	.00	.00	.00	.00	.30	.01	.32	.04
Singapore	SGP	ASIA	1977m1	2006m12	.48	13.97	.00	.00	.00	.00	.00	.69	.00	.76	.01
Sweden	SWE	SCAN	1977m1	2006m12	.93	10.03	.00	.00	.00	.00	.00	.69	.00	.76	.12
United States	USA		1977m1	2006m12	38.95		.00	.00	.00	.01	.00	.69	.00	.76	.00

Figure 7: **Oil price changes and international stock excess returns.** The figure reports for 1977-2006 the monthly cross-correlograms of excess stock returns in Fama and French's portfolios with the Federal funds rate changes. ASIA is an abbreviation for Asian markets; EURO for European markets; SCAN for Scandinavian markets. The solid lines represent high-value ('value portfolio') market excess return, and the dash lines represent low-value ('growth portfolio') market excess return.

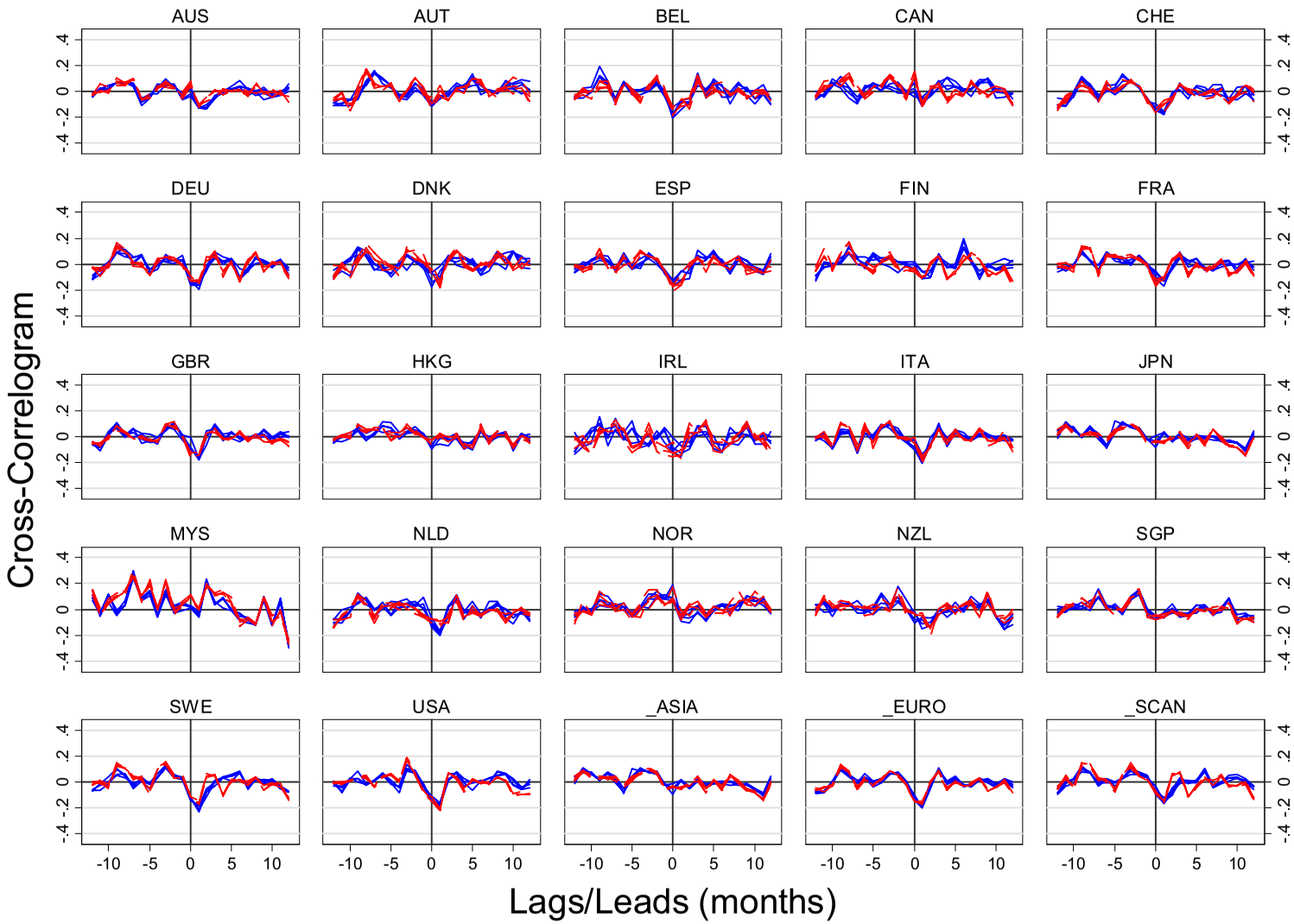


Figure 8: **Federal funds rate changes and international stock excess returns.** The figure reports for 1977-2006 the monthly cross-correlograms of excess stock returns in Fama and French's portfolios with the Federal funds rate changes. ASIA is an abbreviation for Asian markets; EURO for European markets; SCAN for Scandinavian markets. The solid lines represent high-value ('value portfolio') market excess return, and the dash lines represent low-value ('growth portfolio') market excess return.

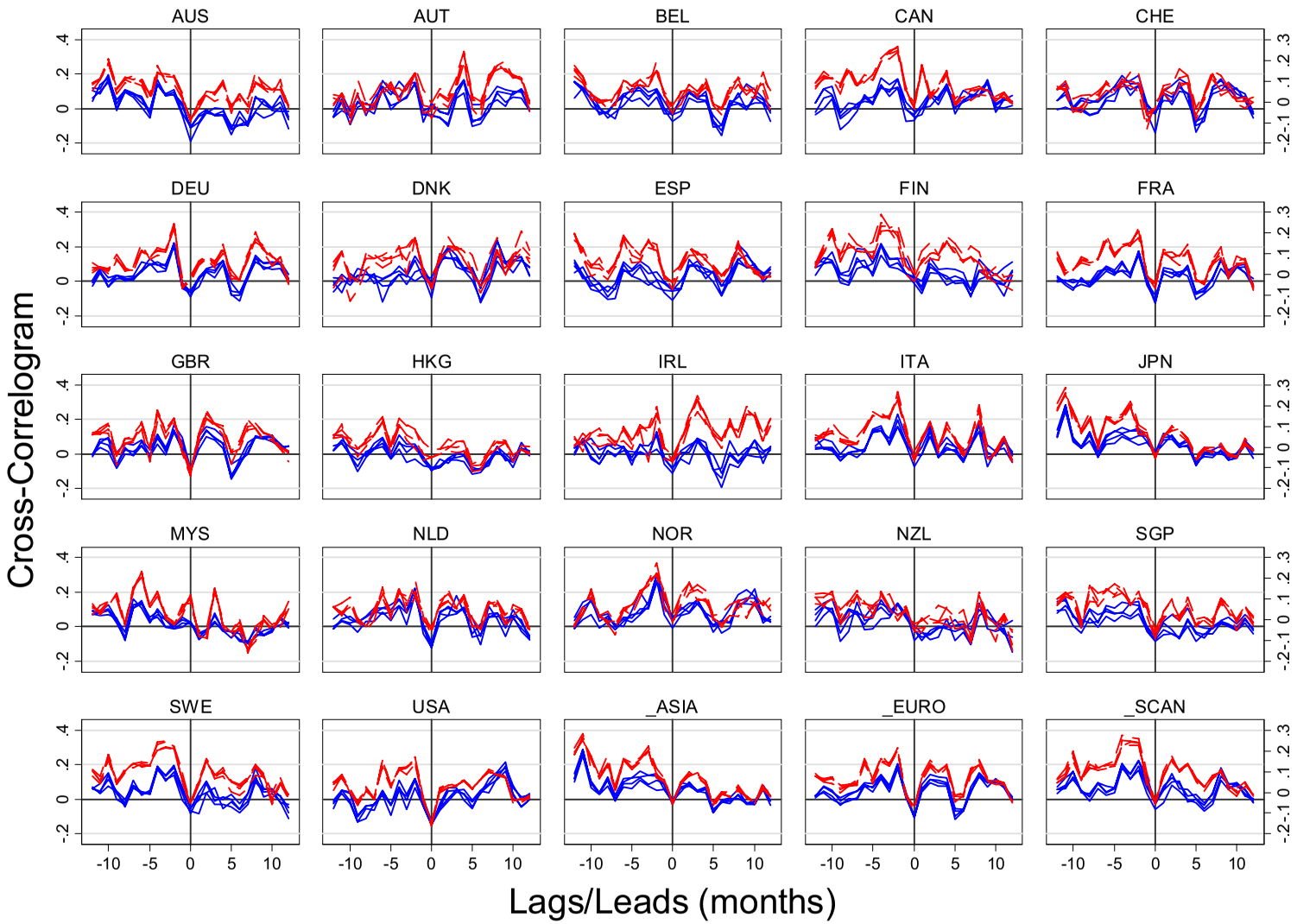
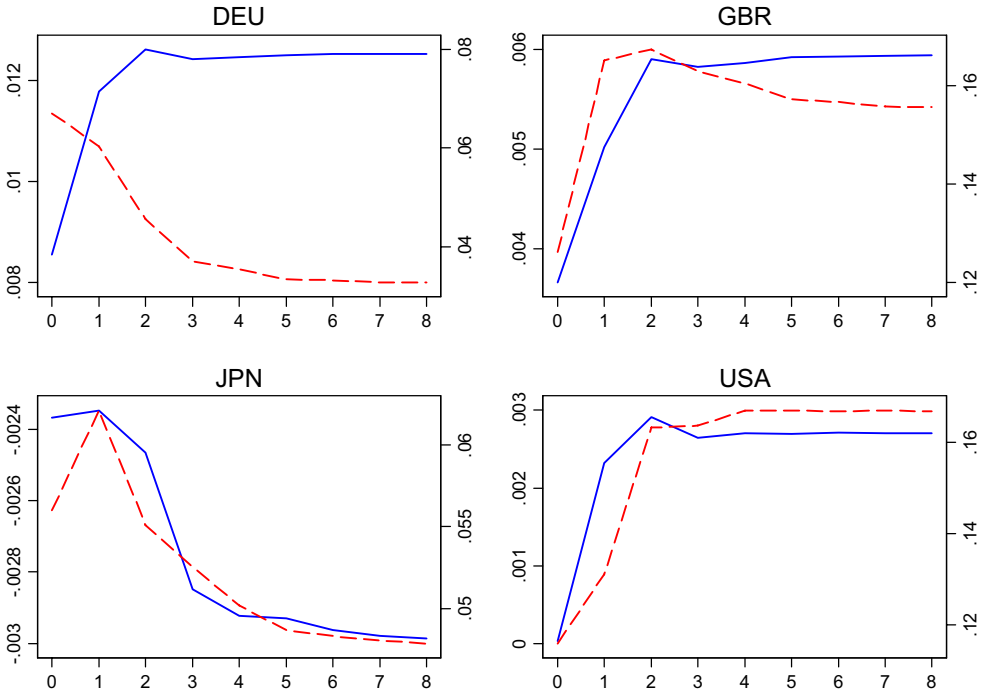


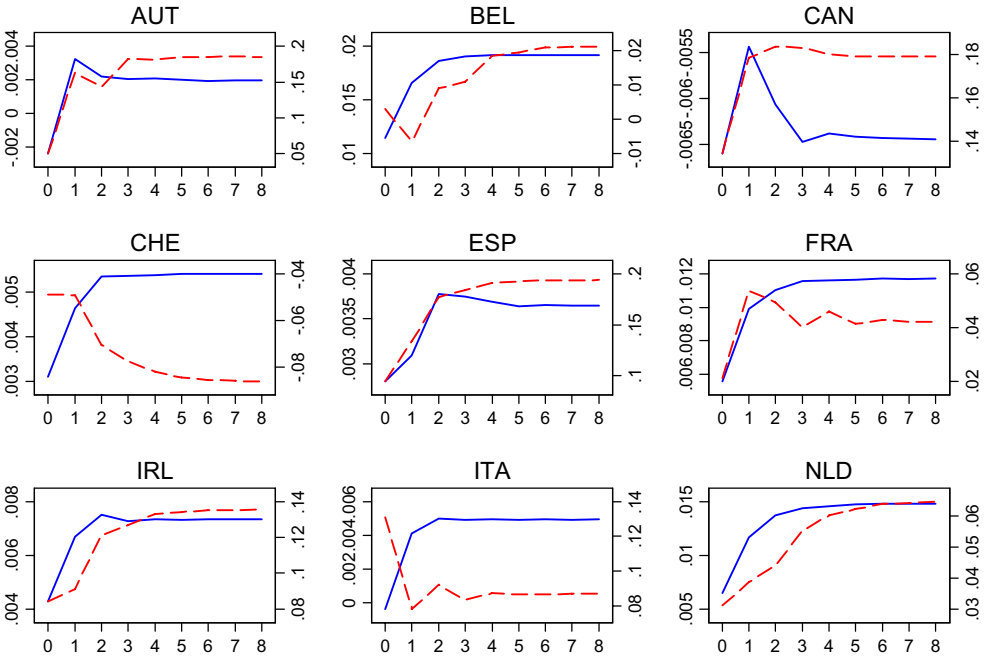
Table 10: **Covariance decomposition and correlations between the U.S. and International excess equity returns.** The table reports a covariance decomposition and correlations between the U.S. and international excess equity returns. All returns are monthly, in dollars. The excess equity return is the difference between the MSCI value-weighted country return (Fama-French) and the 1-month U.S. Treasury bill rate. The first-order VAR is in excess return on U.S. equities, excess return on international equities, U.S. real interest rates, real exchange rates against the U.S. dollars, change in the U.S. nominal interest rate, U.S. term spread, relative U.S. Treasury bill rate, U.S. equity dividend yield, and international equity dividend yield. Forecasts of these variables are then used to calculate excess return innovations and the components of the innovations associated with dividend growths (d), real interest rates (r), future excess returns (f), and real exchange rates (q). The covariance trade (real) linkage is the comovement between future U.S. dividend innovation, e_d, and future international dividend innovation, f_d; the covariance financial linkage is the comovement between future U.S. expected return innovations, e_e, and future international expected return innovation, f_f.

	Covariance Linkages												Correlation Linkages											
News	$cov\left(\widetilde{e}_d, \widetilde{f}_i\right)$				$cov\left(\widetilde{e}_r, \widetilde{f}_i\right)$				$cov\left(\widetilde{e}_e, \widetilde{f}_i\right)$				$corr\left(\widetilde{e}_d, \widetilde{f}_i\right)$				$corr\left(\widetilde{e}_r, \widetilde{f}_i\right)$				$corr\left(\widetilde{e}_e, \widetilde{f}_i\right)$			
Country	d	r	f	q	d	r	f	q	d	r	f	q	d	r	f	q	d	r	f	q	d	r	f	q
AUS	2.18	.06	-.46	-1.E-5	.13	.07	.20	-4.E-6	-2.11	.09	10.75	2.E-6	.34	.10	-.04	-.07	.17	1	.14	-.19	-.23	.10	.58	.01
AUT	.06	.09	.94	2.E-5	.13	.08	.06	-3.E-6	-1.38	.08	8.08	-1.E-5	.01	.13	.07	.10	.17	1	.04	-.12	-.16	.08	.43	-.04
BEL	2.99	.09	-1.07	-5.E-6	.16	.07	.03	-2.E-6	-1.67	.07	5.51	-2.E-5	.40	.14	-.12	-.03	.20	1	.03	-.09	-.17	.07	.44	-.06
CAN	3.75	.05	-1.10	-1.E-5	.16	.07	.15	-2.E-6	-2.58	.10	11.81	2.E-6	.65	.08	-.11	-.15	.24	1	.13	-.16	-.31	.12	.82	.01
CHE	2.04	.08	-.78	7.E-6	.16	.07	-.08	-2.E-6	-1.85	.05	7.93	-1.E-5	.36	.13	-.08	.04	.24	1	-.07	-.09	-.23	.05	.58	-.04
DEU	2.97	.08	-1.08	-1.E-6	.22	.07	-.04	-3.E-6	-2.34	.06	8.14	-6.E-6	.44	.13	-.10	-.01	.27	1	-.03	-.14	-.23	.07	.51	-.02
DNK	1.87	.11	.13	2.E-5	.20	.09	-.03	-1.E-6	-.74	-.03	9.36	-3.E-7	.34	.17	.01	.09	.28	1	-.03	-.06	-.10	-.04	.64	.00
ESP	5.23	.10	-1.86	-6.E-7	.23	.07	-.06	-3.E-6	-1.18	.06	7.27	-3.E-6	.50	.16	-.17	.00	.21	1	-.05	-.14	-.08	.06	.49	-.01
FIN	5.38	.13	-5.71	2.E-5	.23	.09	-.22	-2.E-6	-2.87	.01	10.08	2.E-5	.43	.19	-.38	.07	.15	1	-.12	-.10	-.19	.01	.54	.08
FRA	4.22	.09	-1.63	2.E-6	.18	.07	-.03	-3.E-6	-2.60	.06	8.62	-1.E-5	.49	.14	-.14	.01	.18	1	-.02	-.13	-.22	.06	.54	-.05
GBR	2.55	.07	-1.10	3.E-5	.07	.07	.08	-2.E-6	-1.49	.09	8.91	-1.E-5	.46	.11	-.11	.15	.12	1	.07	-.08	-.19	.10	.61	-.04
HKG	3.24	.08	-1.15	2.E-6	.01	.08	.31	-2.E-6	-1.39	.09	11.95	3.E-6	.31	.12	-.07	.02	.01	1	.16	-.23	-.09	.10	.51	.03
IRL	1.79	.09	.31	7.E-6	.14	.10	-.02	-4.E-6	-.57	.03	11.31	2.E-5	.41	.14	.03	.05	.22	1	-.01	-.21	-.09	.03	.77	.09
ITA	1.54	.07	-.21	-7.E-6	.26	.07	-.01	-4.E-6	-.77	.07	8.39	-4.E-6	.17	.12	-.02	-.04	.25	1	-.01	-.17	-.06	.07	.43	-.01
JPN	1.25	.08	-.80	2.E-6	.10	.07	.06	5.E-7	-.77	.06	5.74	6.E-6	.15	.12	-.07	.01	.11	1	.04	.02	-.07	.06	.36	.02
MYS	.87	.07	.43	9.E-6	.13	.06	-.01	-6.E-8	-3.93	.08	16.13	-4.E-5	.08	.16	.03	.05	.09	1	-.01	.00	-.18	.09	.54	-.10
NLD	3.43	.08	-1.23	2.E-5	.15	.07	.10	-1.E-6	-2.26	.10	8.61	-2.E-5	.54	.12	-.13	.11	.21	1	.09	-.06	-.26	.11	.64	-.06
NOR	2.70	.09	-.28	-9.E-7	.10	.08	.15	-1.E-6	-3.24	.12	13.36	2.E-5	.31	.14	-.02	.00	.10	1	.10	-.06	-.25	.12	.67	.07
NZL	1.76	.13	.16	-3.E-5	.28	.09	.06	-6.E-6	-2.73	.01	7.47	3.E-5	.24	.19	.01	-.17	.30	1	.04	-.26	-.29	.01	.51	.15
SGP	2.34	.09	-1.53	-5.E-6	.03	.08	.21	-3.E-6	-2.45	.07	12.06	8.E-6	.31	.14	-.11	-.05	.03	1	.13	-.22	-.23	.08	.63	.06
SWE	4.08	.09	-.99	-1.E-5	.21	.07	-.04	-1.E-6	-2.91	.10	9.74	2.E-5	.46	.15	-.09	-.06	.20	1	-.03	-.06	-.22	.10	.56	.06

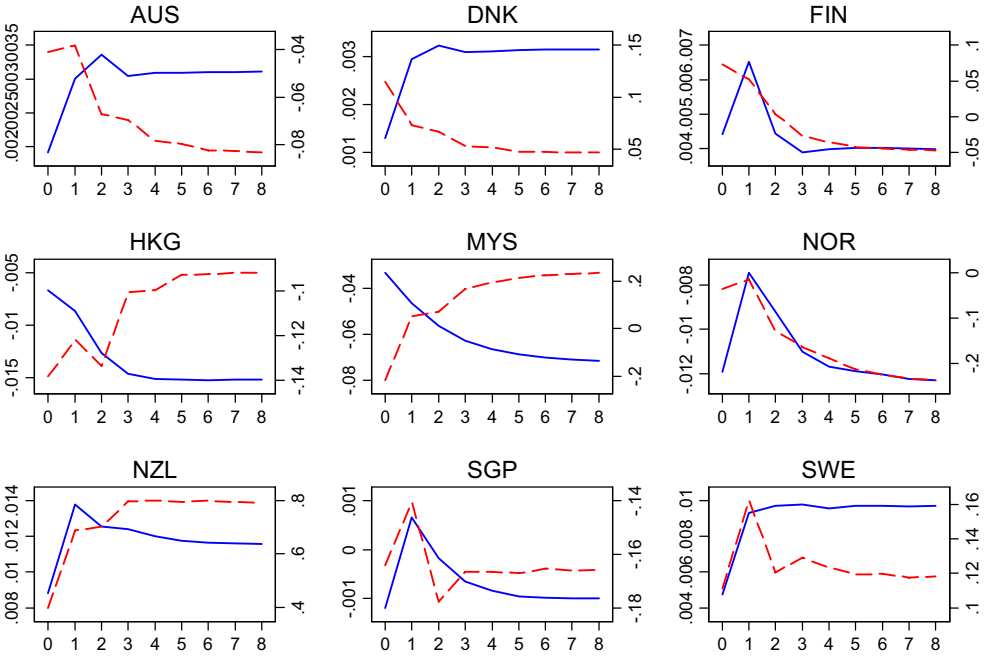
Figure 9: **Dynamic reaction of dividend-price ratios to oil price and Fed policy shocks.** Each panel reports dynamic responses of the country's dividend-price ratios to an unexpected increase of the oil price by one dollar per barrel in solid line and of the Federal funds rate by one hundred basis points in dash line. The contemporaneous responses to the oil price and funds rate are estimated on the February 1994-December 2006 sub-sample. A nine-variable first-order VAR, estimated over the January 1977-December 2006 sample, is used to project the future path of each country's dividend-price ratios.



European Markets



Asia&the Pacific and Scandinavian Markets



Explaining the reaction of global equity markets: Robustness using the Earnings to Price (E/P) Value-Growth Portfolios

	Gravity Method				De Facto Measure				Covariance Linkages				Correlation Linkages			
	Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate	
Impacts on current excess return innovation																
Trade integration	.10	[.07]	-3.67	[1.94]*	.00	[.05]	.72	[1.83]	-.09	[.02]***	.52	[0.91]	-1.40	[.39]***	-10.68	[16.18]
Financial integration	-.24	[.10]**	8.56	[3.06]**	-.14	[.08]*	2.91	[3.35]	.00	[.01]	.53	[0.63]	.07	[.50]	42.74	[21.91]*
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.06	[.08]	1.12	[2.77]	-.06	[.08]	1.12	[3.10]	-.06	[.07]	1.12	[3.11]	-.06	[.06]	1.12	[2.92]
R^2	.23		.24		.15		.04		.38		.04		.59		.15	
Impacts on dividend news																
Trade integration	.04	[.05]	-1.93	[1.43]	-.02	[.03]	.94	[1.44]	-.04	[.02]**	.10	[0.68]	-.60	[.25]**	-7.10	[12.93]
Financial integration	-.12	[.08]	5.92	[2.28]**	-.09	[.05]*	1.21	[2.42]	-.01	[.01]	-.17	[0.44]	.02	[.31]	23.80	[16.67]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.07	[.05]	2.02	[1.96]	-.07	[.05]	2.02	[2.20]	-.07	[.05]	2.02	[2.22]	-.07	[.04]	2.02	[2.13]
R^2	.22		.25		.21		.06		.31		.04		.37		.12	
Impacts on discount rate news																
Trade integration	-.14	[.04]***	-.74	[1.21]	.09	[.07]	-2.23	[1.41]	-.02	[.03]	-.72	[0.62]	-.91	[.46]*	-6.92	[14.07]
Financial integration	.38	[.08]***	-3.22	[1.61]*	.12	[.08]	-3.94	[2.31]	.01	[.02]	-.61	[0.65]	2.44	[.61]***	2.38	[20.45]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.12	[.06]*	9.76	[1.85]***	-.12	[.09]	9.76	[1.84]***	-.12	[.09]	9.76	[1.90]***	-.12	[.07]	9.76	[2.01]***
R^2	.55		.61		.17		.62		.11		.59		.50		.55	
Impacts on future excess return news																
Trade integration	-.06	[.03]**	1.75	[0.60]***	-.02	[.02]	.25	[0.60]	.05	[.01]***	-.41	[0.25]	.82	[.18]***	3.65	[5.23]
Financial integration	.12	[.03]***	-2.61	[0.91]***	.05	[.04]	-1.66	[1.26]	.00	[.01]	-.70	[0.24]***	-.07	[.24]	-18.97	[9.12]*
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.01	[.04]	.80	[1.08]	-.01	[.04]	.80	[1.12]	-.01	[.03]	.80	[1.00]	-.01	[.02]	.80	[1.07]
R^2	.22		.22		.13		.16		.43		.33		.74		.23	

Explaining the reaction of global equity markets: Robustness using the Cash Flow to Price (C/P) Value-Growth Portfolios

	Gravity Method				De Facto Measure				Covariance Linkages				Correlation Linkages			
	Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate	
Impacts on current excess return innovation																
Trade integration	.10	[.04]**	-3.03	[1.89]	.05	[.05]	2.12	[1.86]	-.07	[.03]**	.01	[1.05]	-1.18	[.42]**	-17.95	[17.27]
Financial integration	-.15	[.07]**	7.92	[3.36]**	-.04	[.07]	5.02	[3.30]	.00	[.02]	.97	[0.72]	-.09	[.57]	44.88	[23.63]*
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.07	[.09]	-1.13	[2.99]	-.07	[.09]	-1.13	[3.13]	-.07	[.08]	-1.13	[3.19]	-.07	[.07]	-1.13	[3.10]
R^2	.14		.18		.09		.10		.28		.07		.47		.12	
Impacts on dividend news																
Trade integration	.04	[.03]	-1.51	[1.44]	.01	[.03]	2.16	[1.42]	-.03	[.02]	-.32	[0.77]	-.38	[.33]	-13.22	[12.78]
Financial integration	-.06	[.05]	5.80	[2.44]**	-.02	[.05]	2.87	[2.30]	-.01	[.01]	.15	[0.49]	-.20	[.44]	26.50	[16.43]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.07	[.06]	.36	[2.03]	-.07	[.06]	.36	[2.17]	-.07	[.06]	.36	[2.27]	-.07	[.05]	.36	[2.18]
R^2	.10		.21		.08		.10		.15		.01		.22		.08	
Impacts on discount rate news																
Trade integration	-.08	[.04]**	.21	[0.78]	.13	[.06]**	-1.83	[1.25]	-.03	[.03]	-.44	[0.50]	-.92	[.53]*	-2.34	[11.79]
Financial integration	.32	[.08]***	-3.35	[1.36]**	.14	[.07]**	-3.51	[2.13]	.01	[.02]	-.84	[0.51]	2.21	[.69]***	-3.53	[17.66]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.09	[.07]	8.32	[1.62]***	-.09	[.08]	8.32	[1.58]***	-.09	[.08]	8.32	[1.56]***	-.09	[.07]	8.32	[1.73]***
R^2	.47		.60		.26		.62		.10		.63		.44		.54	
Impacts on future excess return news																
Trade integration	-.06	[.02]**	1.51	[0.57]**	-.04	[.02]	.06	[0.63]	.05	[.01]***	-.32	[0.31]	.81	[.13]***	4.75	[6.51]
Financial integration	.09	[.03]***	-2.08	[1.03]*	.02	[.04]	-2.12	[1.29]	.00	[.01]	-.82	[0.28]***	-.13	[.19]	-18.34	[10.61]*
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	.00	[.04]	1.40	[1.21]	.00	[.04]	1.40	[1.18]	.00	[.03]	1.40	[1.05]	.00	[.02]	1.40	[1.19]
R^2	.18		.17		.15		.21		.45		.37		.75		.20	

Explaining the reaction of global equity markets: Robustness using the Dividend to Price (D/P) Value-Growth Portfolios

	Gravity Method				De Facto Measure				Covariance Linkages				Correlation Linkages			
	Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate		Oil Price		Funds Rate	
Impacts on current excess return innovation																
Trade integration	.12	[.06]*	-1.32	[2.43]	.00	[.05]	2.86	[2.02]	-.08	[.03]***	-.41	[1.13]	-1.28	[.43]***	-20.58	[17.55]
Financial integration	-.27	[.10]**	6.50	[3.69]*	-.13	[.08]	3.49	[3.35]	.00	[.02]	.70	[0.77]	-.25	[.55]	35.59	[23.32]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.07	[.08]	.12	[3.17]	-.07	[.09]	.12	[3.26]	-.07	[.08]	.12	[3.32]	-.07	[.06]	.12	[3.26]
R^2	.29		.12		.14		.07		.32		.04		.61		.07	
Impacts on dividend news																
Trade integration	.06	[.04]	-.18	[1.83]	-.02	[.03]	2.69	[1.54]*	-.04	[.02]*	-.63	[0.84]	-.49	[.31]	-14.81	[13.23]
Financial integration	-.17	[.08]**	4.72	[2.65]*	-.10	[.06]*	1.54	[2.33]	-.01	[.01]	-.10	[0.53]	-.34	[.37]	19.33	[16.68]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.09	[.05]	1.15	[2.21]	-.09	[.06]	1.15	[2.26]	-.09	[.05]	1.15	[2.37]	-.09	[.05]*	1.15	[2.34]
R^2	.32		.17		.21		.13		.27		.04		.41		.06	
Impacts on discount rate news																
Trade integration	-.11	[.04]**	.37	[1.32]	.13	[.07]*	-1.86	[1.57]	-.05	[.03]	-.83	[0.64]	-1.32	[.43]***	-5.83	[14.58]
Financial integration	.32	[.08]***	-3.02	[1.59]*	.13	[.08]*	-4.88	[2.60]*	.02	[.02]	-.96	[0.64]	2.65	[.55]***	-4.11	[21.78]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.27	[.07]***	11.29	[2.04]***	-.27	[.08]***	11.29	[1.87]***	-.27	[.09]***	11.29	[1.87]***	-.27	[.06]***	11.29	[2.08]***
R^2	.57		.62		.43		.68		.39		.68		.66		.60	
Impacts on future excess return news																
Trade integration	-.05	[.03]*	1.14	[0.68]	-.03	[.02]	-.15	[0.66]	.04	[.01]***	-.20	[0.33]	.80	[.18]***	5.83	[6.34]
Financial integration	.10	[.03]***	-1.75	[1.13]	.03	[.04]	-1.90	[1.31]	-.01	[.01]	-.79	[0.28]***	-.11	[.25]	-16.22	[10.17]
Growth portfolio	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]	.00	[.00]	.00	[0.00]
Value portfolio	-.02	[.04]	.91	[1.22]	-.02	[.04]	.91	[1.19]	-.02	[.04]	.91	[1.05]	-.02	[.03]	.91	[1.20]
R^2	.17		.10		.11		.14		.34		.33		.66		.13	