Comparison Analysis of Conventional Index funds and Exchange-Traded Funds

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Purpose, Contribution

- **Purpose**
  - analyzes the substitutability and coexistence of two similar investment vehicles that are conventional index funds and exchange-traded funds (ETFs) in the Korean market.
- **Contribution**
  - contributes to the literature by empirically investigating the substitutability between ETFs and index fund in the Korean market
  - provides a plausible explanation of the coexistence of the seemingly indifferent investment vehicles by examining the behavior of ETFs and index funds investors.

Literature review

- **Elton et al. (2002)** : ETFs have inferior performance than index funds.
- **Gastineau (2004)** : the underperformance of ETFs results from the non-reinvestment of dividends.
- **Guedj and Huang (2003)** : ETFs are a more efficient investment vehicle by comparing the liquidity of ETFs with that of index funds.
- **Poterba and Shoven (2002)** : ETFs are tax-efficient alternatives of the index fund by comparing the differences in the before and after-tax returns on ETF (SPDR) and index fund (Vanguard 500 index)
- **Agapova (2011)** : Conventional index funds and ETFs are substitutes, but not perfect substitutes.

Literature review

In the Korean market,

- **Choi et al. (2012)** : The sensitivity of index fund returns to KOSPI 200 returns is significantly increased after the introduction of ETFs.

- **Lee et al. (2004)** : Approximately 98% ETFs observed are fairly priced and that arbitrage opportunities last only a couple of minutes, on average, although there exist a continuous under-pricing of ETFs and arbitrage opportunities.

- **Chung (2012)** : ETFs tend to be under-priced relative to NAV.

- **Han et al. (2009)** : There is granger causality between KOSPI 200 future and ETFs. They find that KOSPI 200 futures have high endogenous explanatory power and both index funds and ETFs are well explained by KOSPI 200 futures

Main Findings

- The mean tracking error is 0.007786, on average, indicating that ETFs and conventional index funds generally track their underlying indexes closely.

- The mean of tracking errors are not statistically different between the fund types, but ETFs have smaller tracking errors on average.

- Conventional index funds and ETFs are not substitutes, and flows to one fund type do not affect the flow to the other.

Main Findings

- Tax related clientele effects do not seem to influence the cash flow between ETFs and index funds, as investors do not consider them as substitutes.

- The coexistence can be explained by the behavior of fund investors who prefer different characteristics of these funds.

- while the cash flow of ETFs is influenced by fund performance, fund family performance and fund expense, the cash flow of index funds is influenced by fund size, fund age and the existence of big vendors.

Data

- Period spans from Jan. 2006 to Dec. 2011
- Collect from KRX and Zeroin
- Uses matching sample of ETFs and index funds which track same benchmarks (KOSPI200, KRX100, MKF Mid Value, MKF Blue chip30, MKF Green Index and Socially Responsible Index)

- 16 ETFs and 399 index funds

Methodology

- **Performance Measures**
- **1. Tracking Error**

$$TE_{i,t} = |Ret_{i,t} - TargetRet_{i,t} + \frac{1}{252} Exp_i|$$

- **2. Information ratio**

$$IR(InformationRatio) = \frac{Ret_{i,t} - TargetRet_{i,t}}{\sigma(TE_i)}.$$

- **Substitution effect**
- **1. over the study period**

$$FlowIF(ETF)_{i,t} = \alpha_{i,t} + \beta_1 FlowETF(IF)_{i,t} + \beta_2 FlowIF_{i,t-1} + \beta_3 FlowETF_{i,t-1}$$
$$+ \beta_4 FlowIndustry_{i,t} + \beta_5 TargetRet_{i,t-1} + \beta_6 IF(ETF)Ret_{i,t} + \beta_7 IF(ETF)Ret_{i,t-1}$$
$$+ \beta_8 Expenses_{i,t} + \beta_9 LogNAV_{i,t} + \beta_{10} IR_{i,t} + \varepsilon_{i,t}.$$

$$Flow_{i,t} = \frac{NAV_{i,t} - NAV_{i,t-1} \times (1 + R_{i,t})}{NAV_{i,t-1}}.$$

- Ret : The rate return of fund
- TargetRet : The rate return of benchmark index of fund
- Exp : Gross expense rate of fund
- σ(TE) : The standard deviation of the Tracking Error

- FlowIndustry : The cash flows of the fund market as a whole
- logNAV : The logarithm of the total net asset value

Methodology

- **Substitution effect**
- **2. after the end of securities transaction tax exemption**

$$FlowIF(ETF)_{i,t} = \alpha_{i,t} + \beta_1 FlowETF(IF)_{i,t} + \beta_2 After^{*} FlowETF(IF)_{i,t} + \beta_3 FlowIF_{i,t-1} + \beta_4 FlowETF_{i,t-1} + \beta_5 FlowIndustry_{i,t} + \beta_6 TargetRet_{i,t-1} + \beta_7 IF(ETF)Ret_{i,t} + \beta_8 IF(ETF)Ret_{i,t-1} + \beta_9 Expenses_{i,t} + \beta_{10} LogNAV_{i,t} + \beta_{11} IR_{i,t} + \varepsilon_{i,t}.$$

- After : a dummy variable, which is 1 if it is the cash flows of index funds after January 1st, 2010.(after the end of securities transaction tax exemption)
- IRPFlow: the cash flow to the IRP index fund at time *t*

- **Clientele effect**
- **1. Individual Retirement Pension (IRP)**

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowIF_{i,t} + \beta_2 IRPFlow_{i,t} + \beta_3 FlowIF_{i,t-1} + \beta_4 FlowETF_{i,t-1} + \beta_5 FlowIndustry_{i,t} + \beta_6 TargetRet_{i,t-1} + \beta_7 ETFRet_{i,t} + \beta_8 ETFRet_{i,t-1} + \beta_9 Expenses_{i,t} + \beta_{10} LogNAV_{i,t} + \beta_{11} IR_{i,t} + \varepsilon_{i,t}.$$

Methodology

- **Clientele effect**
- **2. Long-term House-purchasing Fund, Long-term Equity Fund of index funds**

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowIF_{i,t} + \beta_2 Home^{*} FlowIF_{i,t} + \beta_3 FlowIF_{i,t-1}$$
$$+ \beta_4 FlowETF_{i,t-1} + \beta_5 FlowIndustry_{i,t} + \beta_6 TargetRet_{i,t-1} + \beta_7 ETFRet_{i,t}$$
$$+ \beta_8 ETFRet_{i,t-1} + \beta_9 Expenses_{i,t} + \beta_{10} LogNAV_{i,t} + \beta_{11} IR_{i,t} + \varepsilon_{i,t}.$$

•Home*FlowIF : A dummy variable which is 1 if the cash flows from LTHF and LTEF index fund are made from July 2008 to December 2009

Methodology

- **The behavior of ETFs and index fund investors**
- **1. The behavior of ETFs investors**

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 flow_{i,t-1} + \beta_2 fundPerf_{i,t-1} + \beta_3 fundTNA_{i,t-1} + \beta_4 FamTNA_{i,t-1} + \beta_5 fundage + \beta_6 expense_{i,t-1} + \beta_7 First + \varepsilon_{i,t}.$$

- fundPerf: the risk-adjusted return calculated from the three-factor model (Fama and French, 1993)
- fundTNA and FamTNA : the logarithms of the lagged total net asset value of the fund and the fund family, which manage fund
- Fundage: the number of years since the fund launch date
- First : a dummy variable, which is 1 if ETF is the first launched product among the ETFs that track the same benchmark.

- **2. The behavior of index fund investors**

$$FlowIF_{i,t} = \alpha_{i,t} + \beta_1 flow_{i,t-1} + \beta_2 fundPerf_{i,t-1} + \beta_3 fundTNA_{i,t-1} + \beta_4 FamTNA_{i,t-1} + \beta_5 fundage + \beta_6 expense_{i,t-1} + \beta_7 bigvendor + \varepsilon_{i,t}.$$

Bigvendor : the dummy variable, which is 1 if the fund is sold by the financial institution whose TNA is over 0.8 billion.

Tracking Error

Index		N	Mean	Standard Deviation	t-value	
KOSPI200	Index fund	276,017	0.0043	0.0104	218.22	***
	ETF	5,298	0.0029	0.0066	32.32	***
	Difference		0.0013	0.0037	14.72	***
KRX100	Index fund	16,402	0.0033	0.0095	44.45	***
	ETF	2,348	0.0047	0.0067	34.32	***
	Difference		-0.0014	0.0027	-9.28	***
MKFGreenIndex	Index fund	1,135	0.0051	0.0187	9.30	***
	ETF	454	0.0089	0.0093	20.28	***
	Difference		-0.0037	0.0093	-5.28	***
MKFBlueChip30	Index fund	179	0.0211	0.0157	18.09	***
	ETF	179	0.0210	0.0155	18.08	***
	Difference		0.0001	0.0001	-3.24	***
MKFMidValue	Index fund	361	0.0023	0.0018	23.72	***
	ETF	361	0.0077	0.0082	17.86	***
	Difference		-0.0054	-0.0064	-12.25	***
SRI Socially Responsible Index	Index fund	2,460	0.0054	0.0077	35.19	***
	ETF	540	0.0062	0.0115	12.52	***
	Difference		-0.0007	-0.0038	-1.42	
mean			0.0077	0.0101		

- ETF groups, implying that index funds and ETFs, on average, outperform their benchmarks.

- The tracking error difference between ETFs and index fund is also significant

Information Ratio

Benchmark		N	Average IR	Standard Deviation	t-value	
KOSPI200	Index fund	276,016	-0.0310	1.0372	-15.74	***
	ETF	5,298	0.0177	1.1675	1.11	
	Difference		-0.0488	-0.1302	-3.02	***
KRX100	Index fund	16,402	-0.0252	1.0362	-3.12	***
	ETF	2,348	0.0129	1.2206	0.51	
	Difference		-0.0382	-0.1844	-1.44	
MKFGreenIndex	Index fund	1,135	-0.0631	0.9995	-2.13	
	ETF	454	-0.0556	1.3624	-0.87	
	Difference		-0.0074	-0.3629	-0.11	
MKFBlueChip30	Index fund	180	0.0042	1.2307	0.05	
	ETF	180	0.0168	1.4510	0.16	
	Difference		-0.0125	-0.2202	-0.09	
MKFMidValue	Index fund	361	-0.0085	1.1998	-0.14	
	ETF	361	0.0082	1.3567	0.12	
	Difference		-0.0168	-0.1568	-0.18	
SRI Socially Responsible Index	Index fund	2,460	-0.0383	1.0524	-1.80	*
	ETF	540	0.0104	1.1597	0.21	
	Difference		-0.0487	-0.1073	-0.90	
Means	Index fund		-0.0270	1.0926		
	ETF		0.0017	1.2863		
	Total means		-0.0126	1.1895		

- On average, ETFs outperformed the index funds although this difference is rather trivial.

- The IR difference between the ETF and index fund is not significant in every group, except in the KOSPI200 group

- Overall, it is difficult to distinguish the performance of the ETFs manager and index fund manager based on IR.

Substitution effect over the study period

	FlowIF		*FlowETF*	
	OLS	SUR	OLS	SUR
Intercept	10,731 (0.09)	0	-0.0162** (-2.37)	0.0025*** (5.58)
FlowETF	-2,123 (0.00)	-11,712 (-0.03)		
FlowIF			-0.000000001 (-0.10)	-0.0000 (-0.03)
$FlowETF_{t-1}$	246,454 (0.61)	264,136 (0.62)	0.0168* (1.65)	0.0717*** (42.25)
$FlowIF_{t-1}$	0.0046 (0.05)	0.0047 (0.05)	-0.00005 (-1.36)	0.00000002*** (4.72)
FlowIndustry	-1.7784 (-1.22)	-1.8414 (-1.23)	0.00000007 (1.02)	0.00000015*** (25.1)
$TargetRet_{t,t-1}$	291,735 (0.09)	253,830 (0.07)	-0.4797** (-2.07)	-1.0453*** (-76.26)
Ret	-775,885 (-0.25)	-767,004 (-0.24)	-0.4955** (-2.17)	0.0199 (1.54)
Ret_{t-1}	190,752 (0.19)	216,501 (0.21)	0.9218*** (20.64)	0.8149*** (211.73)
Expense	-4,259,552 (-0.50)	-4,438,926 (-0.52)	-0.5814 (-0.26)	-0.0137 (-0.39)
LogNAV	967.18 (0.17)	1,535.52 (0.95)	0.0016*** (3.34)	0.00005 (2.41)
IR	17,455 (0.56)	17,635.4 (0.55)	0.0003 (0.21)	-0.0005*** (-3.57)
$Adj.R^2$	-0.00003		0.0919	
$Sys.wR^2$		0.00582		0.00582

- Although coefficients on index funds and ETFs are negative in both equations, they are not statistically significant, implying that there is no significant substitution effect.

- This result can be explained by the different organizational structure and characteristics between ETFs and index funds in the Korean market.
  -Short-term investment vs. Long-term investment

Clientele effect
1. Individual Retirement Pension (IRP)

	FlowETF	
	coefficients	t-value
Intercept	-0.0164	-1.63
flowIRP	-0.0010	-0.05
FlowIF	-0.0000	-0.08
$FlowIF_{t-1}$	-0.0000	-1.25
$FlowETF_{t-1}$	0.0267	2.23**
FlowIndustry	0.0000	1.20
$TargetRet_{t-1}$	-0.5092	-2.00**
Ret	-0.4721	-1.89*
Ret_{t-1}	0.9646	17.65***
Expense	-0.2431	-0.09
$LogNAV_{i,t}$	0.0016	2.40**
IR	0.0005	0.29
Obs.	305,736	
$Adj.R^2$	0.0876	

- the coefficients of is not significant, although it is negative. This implies that the cash flow of IRP index funds does not influence the cash flow of ETF.

Clientele effect

2. Long-term House-purchasing Fund, Long-term Equity Fund of index funds

	FlowETF	
	Coefficients	t-value
Intercept	-0.0164	-1.63
Home IF*	-0.0079	-0.07
FlowIF	-0.0000	-0.08
$FlowIF_{t-1}$	-0.0000	-1.25
$FlowETF_{t-1}$	0.0267	2.23**
FlowIndustry	0.0000	1.19
$TargetRet_{t-1}$	-0.5089	-2.00**
Ret	-0.4722	-1.89*
Ret_{t-1}	0.9647	17.64***
Expense	-0.2518	-0.09
$LogNAV_{i,t}$	0.0016	2.40**
IR	0.0005	0.29
Obs.	305,736	
$Adj.R^2$	0.0876	

- The coefficients on is negative but statistically insignificant.

- The tax clientele effect of LTHF and LTEF does not affect the cash flow between ETFs and index funds as investors regard index funds and ETFs

The behavior of ETFs and index fund investors

	$FlowETF_t$	$FlowIF_t$
Intercept	-0.0128*	367,082
	(-1.85)	(0.77)
$flow_{i,t-1}$	0.0669*	-0.0036
	1.79	(-0.04)
$fundPerf_{i,t-1}$	0.2032***	1,613
	4.88	(0.03)
$fundTNA_{i,t-1}$	0.00002	124,024***
	0.17	(8.47)
$FamTNA_{i,t-1}$	0.0008*	57,285
	1.80	(1.53)
fundage	-0.0000003	53.54**
	-0.95	(2.57)
$expense_{i,t-1}$	1.3469*	-4,902,530
	1.90	(-0.57)
First	-0.0002	
	-0.62	
bigvendor		79,695**
		(2.00)
Obs.	9,182	292,319
$adj.R^2$	0.0043	0.0023

- The cash flow of ETFs is influenced by fund performance, fund family performance and fund expense,.

- The cash flow of index funds is influenced by fund size, fund age and the existence of big vendors.