LISTED SECURITIES EXCHANGES.
A VALUE ANALYSIS

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Abstract

Value creation in the securities industry is a topic which is attracting the attention of academic research since the start of a massive consolidation process. Notwithstanding, it is a relatively new field of research. Some research investigates whether concentration (through alliances, joint ventures or mergers) effectively create value while other research focuses on operative or liquidity measures of performance. Our paper carries on an investigation of listed exchanges. After providing an overview of the exchange industry and the economics of listed exchanges, the core of our paper investigates share performances. In particular, we identify three measures of performance: the *Tobin q*, the *relative share performance* and the *relative P/E*.

1. Literature review

The bourgeoning strand of academic research in the field of the exchanges industry started, in relatively recent times, to investigate the economics of exchanges and value creation in the exchange industry, although not in a systematic way.

Quite different are the approaches that have been followed. In most cases efficiency or value creation are examined in relation to issues such as the comparative advantages of governance arrangements or the economic implications of mergers between exchanges. Other bodies of literature build on microeconomic approach describing the profit function and the maximization problem for exchanges. All this models, however, provide a stylized representation of the business of securities exchanges focusing on a narrow definition of profit function.

Some theoretical works present stylized models of exchanges' behavior. Andersen (2005) provides a theoretical framework which jointly analyses the industry structure and exchange' behavior. In his stylized model the author assumes a monopolistic setting in which the exchange maximizes his profits. The outcomes depend on the network externalities at investor level, which are explicitly considered in the model, and the interaction among brokers and of the latter with the exchange. Andersen's study has several interesting implications for exchange's management in that it models the effect of network externalities on pricing.

Another strand of literature focuses on value creation following mergers and alliances investigating how changing ownership impacts on value. The main contributions in the strategic literature comprise those of Arnold *et altri* (1999), Anand and Kanna (2000), Hasan and Malkamäki (2001), Dessein (2005), Gomes-Casseres *et altri* (2006), Hasan *et altri* (2010). The Hasan and Malkamäki's study (2001) is relevant in that it represents one of the first attempts to gain insight into both cost and revenues of stock exchanges. However, their study do not provide a formal representation of cost and revenue functions; it, rather, empirically investugates the productivity of stock exchanges over time. Their findigs suggest that both investments in technology and competition positively affect cost and revenue efficiency. Market size and quality, by contrast, seem to have a positive impact only on revenue efficiency.

The value and governance literature constitutes a relevant stream of research in the exchange industry literature. The contributions are, however, quite heterogeneous at least as regards the notion of value on which they rely, although they share the same goal which is to investigate whether shifting governance from mutual structures to

corporate structures is value enhancing[1] and how governance affects corporate strategies.

Some literature focuses on share performances while other builds on operative performances and, in particular, on accounting measures of operative performances (Roe, Roa operating margins). The prevailing contributions in this field (Aggarwal, 2002; Mendiola and O'Hara, 2004; Otchere, 2006) are mainly empirical, comparing the pre-privatization operating performances of listed exchanges to the post-privatization performances. These studies provide support to the intuition that self-listing leads to increases in profitability and efficiency.

Mendiola and O'Hara (2004) find that exchange privatization provides a value enhancing contribution. The authors analyze how corporate exchanges have performed taking into account both accounting data and return performances. Provided that listed exchanges qualify as self-listed companies, the most obvious benchmark is the return of the exchange's underlying index. The authors, then, perform a comparison between the performances of newly-listed exchanges and those of the Ipo's on the own markets. Finally, the analyze the impact of economic factors on economic performances. According to their results, the equitization of securities exchanges is value enhancing. Not only the exchanges involved have increased their performances after changing the governance structure but they tend to outperform the stocks listed on their index and the other Ipo in their home markets as well.

Aggarwal and Dahiya (2006) come to the same conclusion accounting for the superiority of listed exchanges in terms of both operating and stock market performance compared with demutualised exchanges. Moreover, they expect the transformations that are reshaping the exchange industry to lead to the formation of one or two large exchanges dominating trading.

Despite all the above mentioned contributions agree on the positive impact of privatization on exchange performances there remain an open question. Theoretically, imagining changes in the ownership structure as a continuum ranging from mutual structures, demutualised but private exchanges and listed ones, the improvements in performances for listed exchanges may be attributable both to changes in the business model (the adoption of a for-profit objective function) or to the effects of market discipline. The issue has been recently investigated (Otchere and Oldford, 2011). The study examines changes in operating performances at each stage of the exchange governance continuum, focusing on Roe, Roa, net income margin and share performances. The evidences show that while publicly-traded exchanges fare better than customer-owned exchanges the comparison between *pre* and *post-listing* listing operating performances do not show relevant improvements in profitability. According to the authors these findings would imply that the demutualization itself is sufficient to the owners for extracting rents from the new, for-profit, mandate.

Other research considers various measures of liquidity generally related to the value of trading. The focus here is on the links between ownership structures, developments in market activity and exchange value. The most recent literature in this field explores the rationale of consolidation in the industry at light of the improving effects on liquidity and revenues. Pownall *et altri* (2012) investigate the liquidity effects with reference to the formation of Euronext. After recognizing the benefits of stock exchange mergers in

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[1] For an excellent review of the most relevant contribution in this strand of research, in particular with reference to ownership models and critical factors affecting efficiency, see Lee R., 2010, *Running the World's Markets: The Governance of Financial Infrastructure*, Princeton University Press.

terms of deeper pools of liquidity and, consequently, increased listing an trading revenues, the authors focus on the structural changes by newly consolidated exchanges. By the way, they make an interesting contribution to the debate around market microstructure studying the impact of market segmentation on liquidity. They findings show that segmentation succeed in attracting deeper liquidity and that such increases are to be ascribed to the pre-commitment of listed firms to comply with prime listing standards. As for exchanges' policies these results have relevant implications. The most interesting is that cross-border consolidation would not be *per se* sufficient for improving liquidity without a single national regulator entitled with effective monitoring and enforcement powers. In that case, the improvement in liquidity would occur only in presence of a mechanism credibly signalling stricter financial reporting and disclosure.

Less developed is the literature focusing on share performances. Worthington and Higgs (2005) examine the distribution of share performances with reference to a limited sample of listed exchanges (Deutsche Börse, London Stock Exchange, Australian Exchange and Singapore Exchange) as a basis for determining the market risk (beta). In that, they relate exchanges' share performances with those of the market index. They find that all the returns of the exchanges are positively skewed.

Our paper carries on a broad empirical investigation on the operative and share performances of exchanges. Operative performance analysis is based on the standard measures of operative performance, as in other papers. We add new contribution by giving new insight into the relations between market activity (trading volumes) and performances, in that highlighting different competitive models. Our main contribution to the literature is related to the share performance analysis. In that, after providing an in-depth analysis of multiples for listed exchanges we analyze the distribution of share performances in comparison with the market index for a broad sample of listed exchanges. Here we employ the Worthington and Higgs methodology but on a far wider sample. We refine, then, the analysis by identifying three measures of performance, the first being based on the Tobin q metric and the other two being constructed as relative measures of performances.

The paper is organized as follows. Section 2 describes the methodology and the sample. Section 3 provides an overview of the exchange industry. Section 4 analyses financial performances for listed exchanges while section 6 carries on a thorough analysis of share performances. The paper ends with some brief concluding remarks.

2. Methodology and description of the sample

Our analysis start with a contextualization of listed exchanges within the securities industry. In that, we first provide a broad overview of the industry showing main trends in market activity (trading volumes and listed companies) and basic industry-level performance measures. We draw on figures reported by the World Federation of Exchanges (WFE).

We, then, provide a recognition of the basic economic performances of major exchanges. Our sample draws from the 22 listed exchanges. However, a few of these only on recent times went public. For other four listed exchanges (namely, Warsaw Stock Exchange, Athens Exchange, Philippine Stock Exchange and Bulsa Malaysia) we do not have complete and reliable data. We, therefore, excluded them from the analysis. Therefore, our sample at this stage comprises 16 exchanges. For each exchange we collect quarterly data on basic measures of operative performance.

We focus, in particular, on Roe, Rote and Roce. As for the *Return on Capital Employed*, in particular, we decompose it in two rations expressing the *trading margin* and *trading intensity* respectively. The former (the ratio of Ebit on trading value) is a measure of profitability of trading and expresses the margin that the exchange is able to extract from a unit of trading value; the latter (the ratio of trading value on the capital employed) expresses the productivity of the capital employed. By relating the output to the investments of the exchange, it could be seen as a measure of technical efficiency.

A discussion is needed in relation to the capital employed. As known, capital employed is calculated by subtracting current liabilities from total assets. In that, it equals equity plus total liabilities (i.e., all long term funds employed by the company). Many securities exchanges manage post trading services in relation to which they collect margins from clearing participants (reported as liabilities in the balance sheet) which are, then, invested in special short term assets. For exchanges operating post trading activities such liabilities constitute the very large part of current liabilities while trade and receivables and other current liabilities are, in most cases, marginal compared with long term sources of financing. Since the correspondent investments, therefore, are intended to serve (and match) the exchange's liabilities in relation to clearing margins, total assets should be, more correctly, intended net of the above mentioned investments.

Finally, we provide a broad analysis of share performances for listed exchanges. We start by characterizing the distribution of share performances examining mean, median, volatility, kurtosis and skewness measures. We compare share performances with those of the reference index. Then, we provide more insight into shareholder value focusing on a selected sub-sample of listed exchanges which is restricted to thirteen exchanges that are listed at least from 2006 for reasons of significance of the results. We consider three measures of value. We first use the *Tobin q* for expressing corporate valuation. We express the Tobin q as the ratio of market value of common equity on total asset value where the numerator is expressed as total assets minus book value plus the market value of equity capital. We, then, consider two relative measures of value. The first is based on the performance of exchanges' shares relative to the performance of the index. The second is based on the ratio of the exchange price-to-earnings ratio and the average price-to-earnings ratio of the index on quarterly bases.

3. An industry overview

In this section we sketch the main features of the exchange industry around the world by analyzing developments in market activity. The variables which are mainly used for the purpose of representing the dimension of the industry are market capitalization, number of companies listed and trading volumes. Trading volumes are generally reported in terms of the trading value for cash markets and as number of contracts traded with reference to derivatives market.

These variables, together, contribute to define the overall liquidity of a particular exchange. The trend in listings could be assumed as a good indicator of the competitiveness of exchanges. The greater the number of listings the greater attractiveness of the market place for traders. In today's competitive environment the major attribute of listings is, in particular, the number of foreign listings as it better mirrors the attractiveness of exchanges in the competitive arena. On the secondary market, by combining market capitalization and trading value we may derive the turnover velocity which can be assumed as a good proxy of the liquidity of the exchange.

On primary markets, securities exchanges experienced a growth in number of companies listed during the timeframe 2003-2008, although a slowing down during the last three years (Table 1). The evidence is, however, mixed. In fact, breaking down by macro-regions we observe an overall declining for American exchanges whereas other regions (the Asia Pacific region and the Europe-Africa-Middle East region) experienced a growth in the number of companies listed. The Asian-pacific region, in particular, witnessed a continuing trend in growth of companies listed even after 2008.

Table 1 – Number of companies listed

	2003	2004	2005	2006	2007	2008	2009	2010	2011	Cagr
America	33021	32954	33532	33736	34133	32479	31209	31026	31611	-0.5%
Asia-Pacific	53593	52482	56620	58178	58549	62487	62534	63884	65850	2.6%
Europe-Africa-Middle East	35395	25630	26170	32785	41096	41220	40987	40118	40844	1.8%

Source: Our elaborations on Wfe Statistics.

However, the trend within American exchanges is quite mixed. Nasdaq Omx, Nyse Euronext and the Canadian Tmx count for more than 84% of total listings in the region. Actually, while Nasdaq Omx and Nyse Euronext experienced a sharp decline during from the beginning of 2008, the Canadian exchanges was quite successful in retaining its listings. The attractiveness on listings depends, however, on a broad variety of factors embracing the positioning of the exchange on the worldwide capital market, its structure, organization and governance and the institutional and legal arrangements of its national jurisdiction.

A more appropriate representation of the attractiveness of an area or exchange for issuers is, however, one based on flows rather than on stocks. The yearly balance between new companies listed and de-listings provides a more precise picture of the turnover on primary markets. During the last decade, American exchanges experienced, in aggregate, a lower turnover (computed as the ratio of the net new listed companies during the year and the stock of listed companies at the end of the year) on the primary market than the other macro-regions (Table 2).

Table 2 – Primary market turnover

	2003	2004	2005	2006	2007	2008	2009	2010	2011
America	-4.34%	1.88%	1.75%	1.18%	0.69%	-0.57%	3.37%	-0.42%	1.62%
Asia-Pacific	1.12%	-1.96%	2.85%	2.60%	4.03%	1.06%	2.00%	3.32%	2.97%
EAME	-2.11%	2.44%	2.64%	0.20%	4.72%	-2.40%	-3.58%	-0.47%	-0.33%

Source: Our elaborations on Wfe Statistics.

Asian-Pacific exchanges proved to be, in aggregate, more dynamic in attracting issuers. The greatest exchanges in the region and namely Singapore and Hong Kong present the highest rates of primary market turnover during the crisis period whereas the other relevant exchanges around the world experienced some difficulties to preserve turnover rates on the primary market.

We, now, turn to analyze the dynamics in foreign listings. To this end, we build on the Wfe figures. We analyze, in particular, the magnitude of the phenomena across world exchanges showing how the relative weight of foreign listings over total listing has been evolving over time and deriving a measure of concentration of the market for foreign companies. We take into consideration the flows of newly companies listed over the

timeframe 2003-2011 focusing on 53 Wfe members. Table 3 summarizes the distribution of foreign listings across exchanges.

Table 3 – The distribution of foreign listings

|	2003	2004	2005	2006	2007	2008	2009	2010	2011
%Tot. Listings	11.0%	9.4%	8.0%	11.1%	16.1%	17.2%	17.3%	15.4%	17.8%
Mean	4	5	4.46	6.06	12.08	7.69	4.77	8.06	8.67
Median	0	0	0	1	1.5	0	0.5	1	0
P25%	0	0	0	0	0	0	0	0	0
P75%	2	4	2	6	6.5	4.25	5	6.25	5
Outliers	11	10	11	11	12	12	10	12	11
Market Share Outliers	94.4%	91.1%	94.2%	90.6%	92.6%	95.7%	86.5%	89.9%	93.7%

Source: Our elaborations on Wfe statistics.

During the years, and especially since 2006, the incidence of foreign listings on total listings has been remarkably growing, despite slowing down in 2010 as a result of the crisis. The average number of foreign companies listed has been growing as well. When looking at the 25th and 75th percentile we observe a widening of the distribution to the right side. This is synthomatic of an increased attractiveness of exchanges over foreign companies and marks, to some extent, the intensification of cross-border competition in attracting issuers. However, the market for foreign listings is higly concentrated with those exchanges falling within the last 25th percentile of the distribution controlling roughly 90% of total foreign listings.

Breaking down by macroarea, we find that Deutsche Börse and Lseg counts roughly for 64% of total foreign listings within the European-Middle East region. In the Asian-Pacific region three exchanges (Australian Securities Exchanges, Singapore Stock Exchange and Taiwan Stock Exchange) control rougly 74% of foreign listings. Within the americas Nyse Euronext and Nasdaq Omx control 58.2% of foreign listings in the reagion. The attractiveness of abovementioned exchanges over foreign companies is arguably due to their prestige as international financial centres (i.e. Lseg and Nyse), their particolar vocaton for certain sectors (Nasdaq Omx, Singapore and Taiwan) or for their strategic location (i.e. the role of Deutsche Börse in attracting firms from the Centre-Eastern Eorope).

The attributes of capital markets may, then, be measured in terms of capital market deepening and market liquidity. The former (market deepening) measures the relative importance of capital markets in financing economic activities and could be expressed in terms of market capitalization on domestic GDP. The latter may be defined in different ways. Here we present a measure based on the concept of turnover velocity meant as value of trading on market capitalization.

We now turn to compare main exchanges within the three Wfe's macro-regions in terms of both capital market deepening and turnover velocity. Capital markets in the Asian-Pacific region have been deepening their penetration within their economies. Looking at the ratio of market capitalization on GDP, Asian-pacific exchanges present (with the exception of Tokyo stock exchange) higher ratios than in other countries (Figure 1).

Figure 1 – Market capitalization on GDP
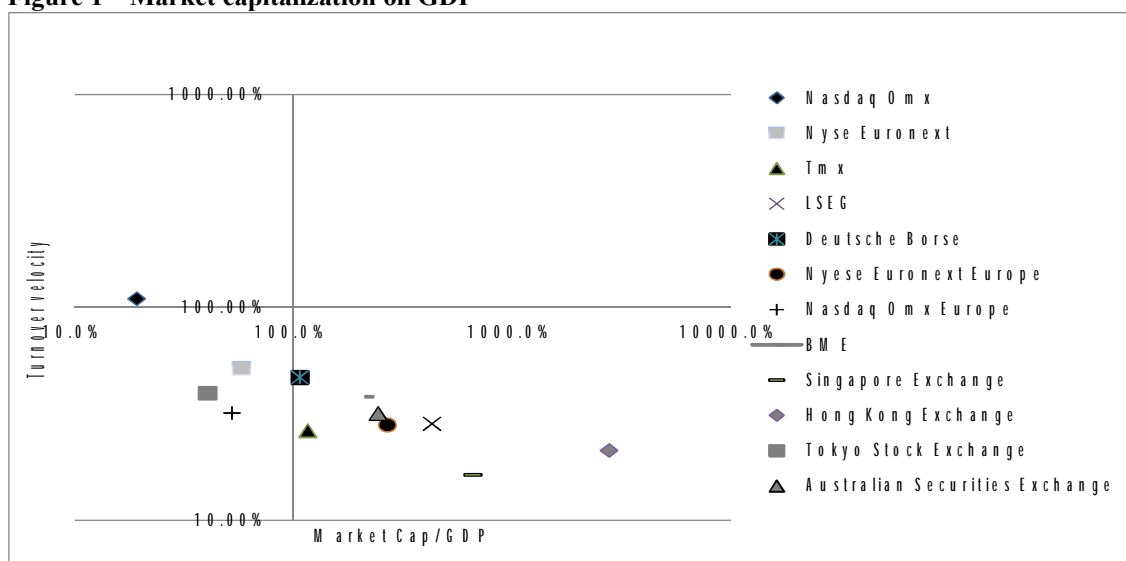
Source: Wfe statistics for market capitalization and turnover velocity and Thomson Reuters Datastream for domestic GDP. Values are exposed in logarithmic scale.

Due to the huge dimension of their capital markets compared with domestic GDP, the ratios of trading values on market capitalization are generally lower for Asian Pacific exchanges. However, and this is true in particular for the Hong Kong Stock Exchange, the incidence of values of share trading on gross domestic product is quite high.

The abovementioned figures on the dynamics on listings and trading activity may suggest a swift of flows across regions and, in perspective, may have relevant strategic implications as for the reorganization of the whole exchange industry. Up to date, the most relevant aggregations between exchanges occurred within Europe and United States and on a transatlantic scale. Looking forward, the dynamics which are now characterizing the industry may open room for a broader restructuring involving western and Asian exchanges which development follows that of their economies[2].

4. An economic analysis of listed exchanges

Nowadays, a great majority of exchanges operating in high income economies and a few located in low-middle income economies are public listed companies. Table 4 reports the evolution of governance structures of exchanges belonging to the World Federation of Securities Exchanges (Wfe).

Table 4 – The changing governance

Legal status	2007	2008	2009	2010	2011
Public listed companies	21	19	19	22	23
Demutualised exchanges with transferable ownership	11	8	9	9	8
Private limited company mainly owned by members	7	7	8	7	8
Association or mutual	4	4	4	3	4
Other legal status	8	7	8	9	9

*Sourece: Wfe, Cost and revenue survey (various years).*

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[2] A first step toward this direction could be detected in the recent cross-quotation agreement between London Stock Exchange Group and Singapore Stock Exchange.

According to Wfe's data, mutual exchanges or associations constitute a marginal class in the international landscape. As we can observe, a wide majority of securities exchanges has been incorporated (public listed companies, demutualised exchanges and private limited companies), although there are, arguably, substantial differences among them. Some 44% of Wfe's members are listed exchanges and comprise the largest players in the world in terms of turnover, Ipo's and capital raised (Nyse Euronext, Nasdaq Omx, London Stock Exchange Group, Deutsche Börse and the largest derivatives centers such as Cme, Cboe and Ice[3]).

According to Wfe figures, listed exchanges counts for roughly 80% of members' aggregate revenues and 79% in trading values on cash markets.

During the time span 2004-2007, the profitability of exchanges rapidly increased. This trend should be interpreted at light of the movements occurring around the exchange industry in that period, which witnessed a speeding up of the consolidation process. Those years were particularly fertile for mergers whit the finalization of the most relevant deals involving the largest western exchanges. Growing profitability was reflected in steep increases in share values of major listed exchanges, mirroring expectations of high growing profits for the near future. However, when breaking down profitability by legal status (Figure 2) the results which emerge are quite heterogeneous.

Figure 2 – Roe and profit margin breakdown by legal status
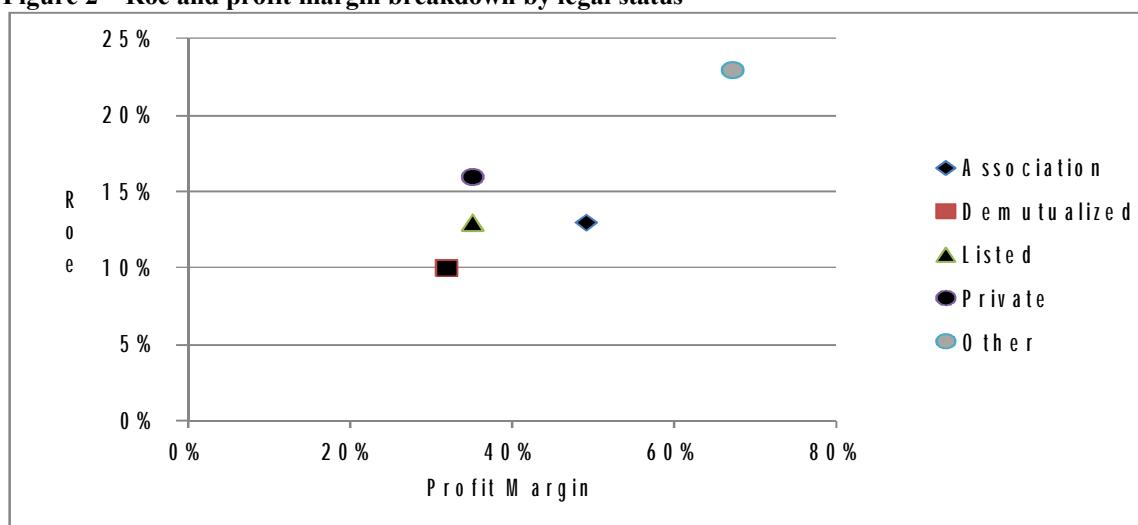
Source: Our elaboration on Wfe's Cost and revenue survey, 2011.

What may result surprising are the lower figures for listed exchanges compared with other legal statuses. Both in terms of Roe and profit margin (expressed as net income on total revenues) economic performance for these exchanges appear quite subdued in the comparison with other statuses. Exchanges incorporated as associations while having roughly the same return on equity fare better in terms of profit margin. Private exchanges are better off listed exchanges as well.

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[3] The other are the Spanish BME, the Brazilian BM&FBOVESPA, the Mexican Exchange, Bulsa de Santiago, Bulsa de Colombia, Johannesburg Stock Exchange, Singapore Exchange, Hong Kong Exchanges and Clearing Houses, Philippine Stock Exchange, Bulsa de Manila, Philippine Stock Exchanges, Australian Securities Exchange and Osaka Stock Exchange, now Japanese Exchange following the merger with Tokyo Stock Exchange closed in 2012 and effective from 2013.

These results may turn to be somewhat contradictory with the widespread belief that for profit listed exchanges would have a strong focus on profit maximization and may result even more surprising at light of the widespread presence of institutional investors in the ownership structure. We may invoke three possible and plausible explanations for what it could appear a puzzle.

First of all, the category of listed exchanges comprises those exchanges that were mainly involved in the consolidation process during the last years incurring, in certain cases, in relevant merging costs. Another possible explanation builds on the competitive pressures which may be, supposedly, greater for listed exchanges. A third explanation for lower profitability ratios for listed exchanges may build on a governance approach. As listed exchanges mainly present a substantially dispersed ownership structure one should be tempted to invoke the separation between ownership and control and the related literature on management's incentives to justify lower performances. Admitting such an explanation would imply that shareholders exert a weak monitoring over managers which, therefore, would be able to consume perquisites or engage in low-profitable investments projects.

When turning to analyze the performances of listed exchanges around the world, there emerge huge differences. We focus, in particular, on Roe, Roce, Rote and the Ebit margin. Table 9 in the appendix reports the average values and the relative standard deviations on a quarterly bases, starting from 2005 and ranging the timeframe to 2011, for the listed exchanges in the sample.

On average, margins are quite sustained across almost all exchanges despite there are divergences which elicit considerations referred both to the business model and the geographical area of influence. To a first instance, exchanges predominantly (or exclusively) engaging in business activities other than cash markets seemingly operate with higher margins. Pure derivatives exchanges (with the exception of CBOE) are among those exchanges with higher margins. Deutsche Börse itself, where cash market revenues are marginal, falls among the more profitable exchanges.

When reading figures in the appendix according to a geographical point of view we observe that exchanges (such as Singapore Exchange, Hong Kong Exchange and the Brazilian BM&FBOVESPA) operating in fast growing areas operate with higher margins that other exchanges. On balance, Asian-Pacific exchanges seemingly operate on a lower locus of the risk-return frontier. While having returns are similar to those of large American derivatives exchanges they have, generally, lower levels of volatility.

Large exchanges in terms of trading values not necessarily produce high margins. Largest exchanges (i.e., Nyse Euronext, Nasdaq Omx and LSEG) have far lower Ebitda margins compared to other exchanges in the sample and high levels of volatility. Moreover, returns are quite subdued for the exchanges as well. When looking, in particular, at the *ROTE*, major concerns may arise as for the sustainability of their businesses.

The Spanish exchange is among those better positioned in terms o average margins and returns and with the lowest levels of volatility. BME represents an interesting case. Despite operating, formally, as a regional exchange, notwithstanding it has a relevant international dimension in particular when considering its tight relations with Latin America.

We now, turn to focus in more detail to the return on capital employed. More precisely, we measure the Roce as the ratio of the operative margin on the capital employed. We, then, break the ratio in order to show the contribution of the *trading margin* and the

trading intensity. Table 5 below reports the main results for our sample of listed exchanges.

Table 5 – Trading margin and trading intensity

	Ebit/TV	TV/Ce
Nyse Euronext	0.00547%	37264%
Nasdaq Omx	0.00602%	37728%
Tmx	0.02390%	22679%
Bovespa	0.10492%	1720%
Bolsa Mexicana	0.06973%	5897%
Bolsa de Santiago	0.01721%	15461%
Deutsche Borse	0.07760%	5814%
Lseg	0.00967%	26333%
Bme	0.02426%	45251%
Osaka	0.08476%	4611%
Hong Kong	0.06642%	28239%
Singapore E	0.11669%	9112%
Australian Se	0.00003%	7251567%
Johannesburg Se	0.00541%	32057%
Colombia	0.04953%	19557%
Philippine Se	0.02380%	17330%
Chi-x Europe	0.00004%	3550186%

The figure above, however, unveils far different patterns in generating margins. While the Singapore based exchange succeed in extracting high margins from trading activity (it has the highest Ebit/Tv ratio) but operates with a low trading intensity, the Hong Kong Exchange has a more balanced contribution of trading margin and trading intensity to the return on capital employed. Largest exchanges (Nyse Euronext and Nasdaq Omx) are among those exchanges with the lowest trading margins. Their model of development is substantially based on expanding quantities.

By contrast, Chi-X Europe while experiencing a fast growth in trading activity during the last years operates, on the other end, with the lowest returns on capital employed. It competes on quantities; its trading intensity is exceptionally high whereas the trading margin is negligible.

5. Share performance.

As known, value creation identifies a multi-facet issue. Broadly speaking, several indicators or metrics may be regarded to as proxies of shareholders value. Prominent research focuses on share performance as a measure of value creation. During the years immediately preceding the crisis major listed exchanges experienced sharp increases in share prices mirroring high expectations of growth in revenues and margins stemming from the ongoing consolidation process. In this section we try to delve in more detail into listed exchanges' share performances during the very last years. We start by presenting the stylised facts. In that, we investigate the returns on share prices and compare them with the returns of the reference index. Then, we explore the relations between share values and major economic and financial data.

Starting with a simple representation of share performances, the raw data employed in the study are the daily share prices for listed exchanges and the daily values of the reference index, assuming the timeframe spanning from 2005 to 2011 (obviously, with the exception of exchanges with a shorter track record). Table 10 in the appendix reports the mean and median daily returns on share prices and the reference index and

explores the characteristics of the distribution as well, as identified by the skewness and the kurtosis. Our analysis extends that of Higgs and Worthington (2005) who focused on four exchanges (Deutsche Börse, LSE, ASX and Singapore Exchange, considering share and index performances up to June 2005).

At a first insight, almost all listed exchanges experienced greater daily returns than the reference index, with Asian exchanges performing far better that the others. Among western markets, the best performances were those of ICE and, to a minor extent, Nyse Euronext and Nasdaq Omx. The exchanges performing better are, generally, those experiencing the greater growth in earnings, despite there are relevant exceptions[4]. Figures unveil relevant differences in volatility as well. As a common pattern is the greater volatility in exchanges' share performance compared with the reference index. There is, however, no clear evidence that best share performances are associated to greater volatility in prices as it could be seen looking at ICE and Hong Kong Exchanges figures.

Looking at the characteristics of the distribution and similarly to Higgs and Worthington, we find that all of returns are positively skewed (except TMX)[5] while index returns are negatively skewed (with the exceptions of BME, LSEG, Deutsche Börse, Bolsa Mexicana, BM&FBOVESPA and Hong Kong Exchanges and HKECH). Figures, therefore, indicate a greater likelihood of large increases in share returns than falls, while the inverse holds for index returns[6]. The kurtosis is also large for all exchanges. On balance, share returns across listing exchanges do not resemble a normal distribution. Share returns (Figure 3 in the appendix), however, present different degrees of volatility and, seemingly, are characterized by a mean reverting attribute.

We, now, provide more insight into shareholder value focusing on a sub-sample of exchanges listed since 2006. We consider three measures of value: the *Tobin q*, the performance of exchanges' shares relative to the performance of the index and the relative P/E index. Such measures are computed on quarterly bases. The table that follows summarizes our value measures.

Table 6 – Value measures

Tobin-q	The ratio of market value of common equity on total asset value where the numerator is expressed as total assets minus book value plus the market value of equity capital.
Rel_Share_Perf.	the ratio between the quarterly variation of the share and the variation of the index. We assign the ratio a negative sign when the share do worse than the index (i.e., a lower positive performance, a greater negative performance or a negative performance when the index has a positive performance) and a positive sign in the opposite case.
Rel_P/E	The ratio of the exchange price-to-earnings ratio and the average price-to-earnings ratio of the index on quarterly bases. We compute the P/E of the exchange as the ratio of the average share price and the earning per share on each quarter.

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[4] Cme despite presenting an high *Eps* CAGR experience poor share performances. Nasdaq Omx itself, while being among the faster growing exchanges as for earnings, presents far lower share performances compared with Asian exchanges.

[5] The distribution of skeweness is normal with median 0 and standard deviation of $\overline{}$ where N is the number of observations.

[6] In those cases where index returns are positively skewed, nevertheless skeveness is lower than that of corresponding exchanges' share returns, with the exception of BME.

Our sub-sample is restricted to thirteen exchanges that are listed at least from 2006 for reasons of significance of the results. Hereafter we present the results of our analysis. We start by providing a broad overview of the performance measures across the exchanges comprised in our sample. Table 7 summarizes the mean and standard deviation of the *Tobin q*, the relative share performance[7] and the relative *price-to-earnings ratio* for the exchanges in the sample.

Table 7 – Performance measures: descriptive statistics

	Tobin q		Relative share performance		Relative P/E	
	Average	St. Dev.	Average	St. Dev.	Average	St. Dev.
NasdaqOmx	1.39	0.52	1.68	13.22	1.09	0.75
Nyse Euronext	1.52	1.03	3.67	17.06	1.38	1.29
Tmx	2.23	0.84	1.90	4.70	1.05	0.49
LSEG	4.19	4.84	2.16	7.97	1.75	0.59
Deutsche Börse	1.06	0.06	2.19	6.33	1.38	0.48
BME	1.11	0.39	0.63	4.30	1.14	0.17
Cme	0.52	0.13	3.71	9.40	1.44	0.79
ICE	0.64	0.30	5.26	15.63	1.49	0.90
Hong Kong	0.84	0.03	38.24	155.02	2.12	0.56
Singapore	4.01	1.17	-2.17	154.95	2.20	0.85
Asx	2.52	2.17	0.70	10.55	1.22	0.47
Osaka SE	0.86	0.02	1.10	18.33	1.23	0.77
Johannesburg	1.96	0.55	3.46	10.45	1.77	0.89

Source: our elaborations on exchanges' accounting data as for company assets and Bloomberg database for share and index performances and P/E measures.

On average, looking at western markets, American exchanges and LSEG are the best performers when looking to the Tobin Q, with higher standard deviations as well. It is interesting the exception of the two large derivatives markets (CME and ICE) for which the measure is the lowest among the sample we considered. Expanding the analysis to the other market centres performances are quite heterogeneous. Singapore securities exchange and ASX (and, to a lower extent, Johannesburg stock exchange) present an high Tobin Q with higher volatility. As for the two relative measures of value (the relative share performance index and relative P/E), evidences are mixed. On average, the Hong Kong exchange has a far higher share performance index among all the exchanges in the sample and is followed by the two large derivatives exchanges, Nyse Euronext and the Johannesburg exchange. It is interesting the case of the Singapore exchange, the only having, on average, a negative value for the index but with high levels of volatility as well. Hong Kong and Singapore exchanges have the highest relative P/E values as well. On balance, such figures are coherent with their character of fast growing markets. Among western exchanges, LSEG and Deutsche Börse are the best performers in terms of the elative P/E compared to American exchanges. The Spanish BME has relative performances which are quite subdued.

Generally, the three measures of performance we considered are positively correlated, with a few exceptions. The most relevant is the ICE, for which the Tobin Q is negatively correlated with the other two measures. Nyse Euronext is the only case of negative correlation between the Tobin Q and the relative share performance. There are,

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[7] Here we calculate the ratio of quarterly share performance on index performance. The ratio assumes positive values where the share experienced better performances than the index (both positive and negative) and negative values in the opposite case.

then, a few cases of negative correlation between the Tobin Q and the relative P/E or between the relative share index and the relative P/E. Table 11 in the appendix presents the correlation matrix between the three measures of performance.

We, then, take a step forward investigating the determinants of exchange performances. In particular, we focus on the Tobin Q and the P/E ratio of each exchange in our sub-sample and relate them with a set of industry-specific and financial variables.

Industry specific variable comprise the degree of liquidity of the stock exchange that we measure by the market turnover (trading value on market capitalization[8]). In the exchange industry studies liquidity is the main attribute of securities exchanges to the extent that it affects the efficiency of price discovery. Besides, we expect liquidity to have a positive impact on exchange's valuation for at least two reasons. First, we expect highly liquid exchanges to attract more customers (i.e., listed companies and traders) due to the well known externality effects. Moreover, since exchange's trading revenues are function of trading values, the highest the turnover the higher the trading fees should be. We accounted for a positive correlation between trading value and listed companies. So there is not the case to consider total listed companies in the analysis. Rather, we consider the ratio of foreign listing on total listings, which is deemed to capture the competitive positioning of the exchange. Financial variables comprise the variation of the earnings per share and the P/E of the index. Governance, however, may have a relevant impact on performances as well, affecting investor protection and the incentives to expropriate minority shareholders. We test four models and, namely, a Tobin Q and P/E model with industry specific and financial variables as explanatory variables and the same models including a governance variable which we identify in the percentage of institutional ownership[9]. We use a pooled model.

Table 8 - Results

	Tobin Q	P/E	Tobin Q (controlling for governance)	P/E (controlling for governance)
Constant	2.9032'***'	23.3201'***'	1.5661'***'	15.485'***'
FListings	-0.0033'**'	-0.0089' '	-0.0004' '	0.0038' '
Turnover	-0.2135' '	-0.4078' '	-0.3378'*'	-0.1078' '
Var. Eps	0.2333'*'	1.1228'.'	0.2029' '	1.2895'*'
Roce	-5.2100'***'	-1.4986' '	-6.0455'***'	0.2515' '
P/E Index	-0.0054' '	-0.0891'*'	-0.0145'.'	-0.0749'.'
Inst. Own.			1.5371'.'	5.9552' '
χ^2 (6)	0.0000	0.0555	0.0000	0.0172
r-sq within	0.2350	0.0559	0.2474	0.0234
r-sq between	0.1051	0.0114	0.5034	0.9336
r-sq overall	0.0246	0.0106	0.2998	0.0973
Number of observations	286	271	153	150

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1. χ^2 test: within brackets, the degrees of freedom.

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[8] Both trading value and market capitalization are taken from the WFE statistics.

[9] In this, we build on standard governance literature. The idea is that the better investor protection and the lower the power to expropriate by controlling shareholders, the higher would be the price that outside investors would agree to pay for financial assets. La Porta *et altri* (2002) examine how ownership structure affects corporate value using the *Tobin q* and the price to cash flow ratio for measuring corporate valuation.

The models we investigated seemingly fit well our data set, especially the Tobin Q model (either when including or excluding the governance variable), according to the chi-square value (Table 8). The r-squares, however, are low. Within effects are greater for the Tobin Q model, whereas are negligible for the P/E model. The inclusion of the governance variable rises, however, the r-square (in particular, the r-square between and overall) in the Tobin Q model.

Seemingly, the Tobin Q is better explained by the variables included in the model. It is interesting to note that the sign of the coefficients are generally negative, with the exception of the eps variation and the institutional ownership, which may appear somewhat counterintuitive. One would expect the competitive positioning (measured by the number of foreign listings) and the liquidity levels to positively affect performances. In particular, as the competitive positioning and liquidity improve, the overall risk of the exchange would be expected to decline (However, as we have noted, greater levels of the Tobin Q metric are associated to greater degrees of volatility). Downward revisions in the appraisal of risk would, therefore, sustain market prices. A possible explanation of the pattern we observe is that attracting issuers and rising turnovers would require to adopt aggressive pricing policies to cope with increasing competition, putting pressures on earnings. However, the crisis and the transformations that the industry is undergoing have, arguably, played a relevant role. Share prices experienced a sharp decline after rising in the pre-crisis period. By contrast, foreign listings remained more stable[10] and trading volumes generally recovered. Relevant differences, however, emerge as regards the significance of the explanatory variables. Foreign listings, however, present an high degree of significance as well. By contrast, turnover is not significant in explaining the Tobin Q. The return on capital employed itself has a negative sign (and a great level of significance). Actually, during the last years exchanges experienced increases in returns associated to increases in the capital employed with the latter being related, in many cases, to the consolidation process. Mergers are aimed to improve efficiency and find new sources of revenues but result in an expansion of capital invested.

6. Concluding remarks.

The global exchange industry is undergoing a substantial transformation following two paths. The first is the increasing competition between trading platforms (exchanges and other platforms). The second is the deep consolidation process which is reshaping the morphology of the industry. As noted, the aforementioned developments are driven by the strategic decisions of large institutional investors who are the main shareholders of major groups. The new competitive environment radically changed the long established paradigms of managing exchanges with implications for the governance mechanisms. The currently prevailing vested interests strongly act in a way to promote value creation for shareholders, whereas in the past the promoters of exchanges strategies were the platform users. Actually, it is certainly true that large shareholders of listed exchanges are interested in the functioning of trading platforms. Arguably, however, their interests as shareholders tend to prevail on their utility as platform users.

As noted, Asian exchanges are at the top of the rank taking into account selected performance measures. The largest exchanges, in particular the American exchanges which recently were at the forefront of the widespread consolidation process that

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[10] Actually, apart major exchanges, for the others the attractiveness on foreign issuers is more sticky.

interested the industry, are on the bottom side. By the way, these developments elicit the question on which equilibrium will be attained as the industry will come to a standpoint. In that, the problem of value becomes of paramount importance in a context of the ongoing consolidation process for the practical reason of determining the relative values of merging entities and coming to a fair determination of the considerations owed to shareholders of acquired firms. Moving the reasoning on a strategic ground, value creation is important in order to determine who will lead the next stages in the consolidation process. Relative values mirrors the success in competitive strategies and those exchanges realizing the better outcomes will bear an active role in defining the competitive paradigms. So far, the consolidation process largely interested western markets, but recently the Asian landscape started to show movements with the merger between the two Japanese exchanges (Tokyo and Osaka exchanges). It is to be expected, however, that the process will be expanding further bridging Asian and western markets. By the way, the strategic implications of consolidation are mirrored by the recovering multiples, after the declines observed during the crisis, in most recent mergers.

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Appendix
Table 9 – Performance measures

	Ebitda %		Roe		Rote		Roce	
	Average	Rel. St. Dev	Average	Rel. St. Dev	Average	Rel. St. Dev	Average	Rel. St. Dev
Nyse Euronext	17.5%	164%	0.9%	556.1%	-1.1%	960.6%	1.3%	233.6%
Nasdaq Omx	23.2%	53.4%	5.5%	151.7%	-3.15	800.3%	3%	126.8%
Tmx	56.1%	19.5%	10.3%	60.3%	6.9%	454.8%	3.04%	35.9%
CME	69.6%	11.2%	3.6%	84.4%	-0.6%	1247.7%	6.6%	101.3%
CBOE	48.1%	11.6%	10.6%	37.2%	12.8%	41.4%	15%	36.8%
ICE	65.3%	19.3%	5.3%	55.4%	-114.4%	366.8%	4.3%	122.1%
BM&FBOVESPA	61.7%	22.5%	1.1%	50.25	5.7%	60.1%	1.3%	39.6%
Bolsa Mexicana	41.4%	13.6%	2%	131.8%	2.7%	132.4%	3%	30.8%
Bolsa de Santiago	34.4%	19.1%	6.15	36.6%	6.15	36.6%	4%	23.8%
Deutsche Börse	58.1%	12.7%	6.5%	32.5%	389.45	375.1%	5.8%	34.2%
Lseg	41.7%	104.7%	-0.8%	973.3%	-3%	474.8%	-6.5%	701.9%
BME	70.7%	10.3%	7.9%	35%	9.8%	34.9%	11%	22.7%
Osaka SE	55.4%	15.6%	3.4%	41.6%	4.2%	40.4%	4%	26.2%
Hong Kong Exchanges	71.5%	14.3%	14.4%	38.8%	14.4%	38.8%	9.15	35.5%
Singapore Exchange	62.65	14.9%	11.5%	29.6%	13%	25.7%	13.5%	29%
Australian SE	69.9%	15.6%	4.9%	80.8%	15.5%	22%	5.6%	79%
Johannesburg SE	30.6%	46.3%	5.5%	40.2%	6.4%	41.5%	4.8%	57.1%
Bulsa Colombia	40%	46.4%	7.8%	56.3%	7.8%	56.3%	6.2%	60.7%

Table 10 – Share and index performance

	Nyse Euronext		Nasdaq Omx		TMX		BME		Japan SE		Johannesburg SE		Singapore SE	
	Share	Index	Share	Index	Share	Index	Share	Index	Share	Index	Share	Index	Share	Index
Obs.	1824	1824	1824	1824	1824	1824	1425	1425	1899	1899	1401	1401	1755	1755
Start date	04/01/05	04/01/05	04/01/05	04/01/05	04/01/05	04/01/05	17/07/06	17/07/06	5/4/04	5/4/04	06/06/06	06/06/06	04/01/05	04/01/05
End Date	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11
Mean	0.0765	0.0127	0.0988	0.0127	0.0433	0.0228	-0.0030	-0.0040	0.1149	0.0144	0.1413	0	0.0991	0.0194
Median	-0.0323	0.0544	0	0.0544	0	0.0590	-0.0441	0.0139	0.1123	0.0248	0	0.1019	0	0.0929
St. Dev.	3.6350	1.4346	0.1020	1.4346	1.9571	0.0175	0.0442	1.7369	3.368	1.4917	2.6217	0.0462	0.0577	0.0168
Skewness	2.9146	-0.0436	0.6078	-0.0436	-0.2335	-0.4603	0.1987	0.4217	0.7923	-0.1784	8.8084	-13.5704	0.5067	-0.1796
Kurtosis	47.7206	12.6268	8.7204	12.6268	9.1711	11.7116	5.1641	10.1815	6.938	11.464	198.0359	364.1386	6.6204	7.9760

	CME		ICE		CBOE		LSEG		Deutsche Börse		ASX		Bolsa Mexicana	
	Share	Index	Share	Index	Share	Index	Share	Index	Share	Index	Share	Index	Share	Index
Obs.	1824	1824	1598	1598	404	404	1824	1824	1824	1824	1825	1825	895	895
Start date	04/01/05	04/01/05	16/11/05	16/11/05	15/06/10	15/06/10	04/01/05	04/01/05	04/01/05	04/01/05	04/01/05	04/01/05	13/06/08	13/06/08
End Date	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11	30/12/11
Mean	0.0479	0.0127	0.1715	0.0128	-0.0041	0.0439	0.0524	0.0169	0.0672	0.0285	0.0283	-0.0302	0.0585	0.0350
Median	0	0.0544	0	0.0600	0	0.0529	0	0	0	0.0726	0	0.0020	0	0.0879
St. Dev.	2.8907	1.4346	0.1570	1.5128	2.2099	1.300	2.6856	1.3366	2.5015	1.4936	1.9703	2.0350	2.2046	1.6278
Skewness	0.1068	-0.0436	2.0314	-0.0428	0.3708	-0.4003	1.2896	0.0614	0.3653	0.2860	0.4496	-21.2695	0.5007	0.4461
Kurtosis	10.0924	12.6268	29.4436	11.6456	6.2486	6.3299	17.6066	10.8930	8.2134	10.6359	17.8673	719.0109	6.4910	9.4171

	BM&FBOVESPA		Hong Kong Exchange	
	Share	Index	Share	Index
Obs.	1065	1065		
Start date	03/12/07	03/12/07	04/01/05	04/01/05
End Date	30/12/11	30/12/11	30/12/11	30/12/11
Mean	-0.0209	-0.0127	0.1366	0.0311
Median	0	0	0	0.0753
St. Dev.	3.6099	2.6596	2.6039	1.8045
Skewness	0.4815	0.3356	0.7349	0.3260
Kurtosis	8.3325	7.4422	8.8590	11.4079

Table 11 – Correlation matrix

NasdaqOmx	Tobn q	Rel. Sh. P.	Rel P/E	Nyse E.	Tobn q	Rel. Sh. P.	Rel P/E
Tobn q	1			Tobn q	1		
Rel. Sh. P	0.5055	1		Rel. Sh. P	-0.2622	1	
Rel P/E	0.8523	0.3130	1	Rel P/E	0.9063	-0.1235	1
Tmx	Tobn q	Rel. Sh. P.	Rel P/E	LSEG	Tobn q	Rel. Sh. P.	Rel P/E
Tobn q	1			Tobn q	1		
Rel. Sh. P	0.2327	1		Rel. Sh. P	0.1019	1	
Rel P/E	0.7976	0.5100	1	Rel P/E	0.6100	0.2649	1
Deutsche B.	Tobn q	Rel. Sh. P.	Rel P/E	BME	Tobn q	Rel. Sh. P.	Rel P/E
Tobn q	1			Tobn q	1		
Rel. Sh. P	0.3178	1		Rel. Sh. P	0.3092	1	
Rel P/E	0.2312	0.5204	1	Rel P/E	0.0733	0.3910	1
CME	Tobn q	Rel. Sh. P.	Rel P/E	ICE	Tobn q	Rel. Sh. P.	Rel P/E
Tobn q	1			Tobn q	1		
Rel. Sh. P	0.3533	1		Rel. Sh. P	-0.2633	1	
Rel P/E	0.4796	0.3939	1	Rel P/E	-0.7961	0.4011	1
HKECH	Tobn q	Rel. Sh. P.	Rel P/E	Singapore	Tobn q	Rel. Sh. P.	Rel P/E
Tobn q	1			Tobn q	1		
Rel. Sh. P	0.3488	1		Rel. Sh. P	0.0543	1	
Rel P/E	-0.5211	-0.025	1	Rel P/E	0.0324	-0.5388	1
ASX	Tobn q	Rel. Sh. P.	Rel P/E	Osaka	Tobn q	Rel. Sh. P.	Rel P/E
Tobn q	1			Tobn q	1		
Rel. Sh. P	0.1987	1		Rel. Sh. P	0.0285	1	
Rel P/E	0.0315	-0.0601	1	Rel P/E	N.A.	N.A.	1
Johannesburg	Tobn q	Rel. Sh. P.	Rel P/E				
Tobn q	1						
Rel. Sh. P	0.1643	1					
Rel P/E	0.3744	-0.1149	1				

Figure 3 – Share returns