Relative valuations:
An application to the Korean automobile industry

Chang Han Joo*
University of Melbourne

"As is all often the case, we find ourselves playing theoretical catch-up trying, after the fact, to develop a framework for thinking about the events that have already happened." Krugman(1998)

1. Introduction

The valuation of financial assets is one of the most important issues in contemporary finance, not only because of its importance in investment decisions but also because of its economic significance. Overvaluation of financial assets typically induces overconsumption and undersaving. Undervaluation encourages higher savings rates, and inappropriate spending on infrastructure.

Financial valuation models have not benefitted from the systems approach in economics, which has long recognised the importance of relative price effects. In finance, the most common equity valuation models value a single asset and ignore asset relativities with assets in the same industry. For example, this is the approach of the dividend discount model (DDM) and free cash flow (FCF) valuations. The essential idea is to derive the present value of expected future cashflows (dividends or free cashflow). A recurring observation has been that such valuations often differ substantially from observed prices. One reason is that the traditional valuation models are difficult to implement because forecasting over a finite horizon is difficult. In particular, valuations are very sensitive to terminal values, those values representing cashflows more than 2 years ahead. Often such terminal values account for more than 50% of the valuation of an equity.

Significant developments in the economy also distort valuations. In Korea, structural shifts towards a more open economy, and to a more technologically based economy have meant that valuations are more difficult. Just as internet asset economies are difficult to value, so is a market such as Korea where there is considerable transition. Emerging equity markets such as Korea tend to restrict the supply of equity through the concentration of share ownership. In such markets, speculative price bubbles often occur and recur. Valuation trading often constitutes only 10% of trading. Explosive increases and decreases in prices are common as shown in the behaviour of the stock market index, the KOSPI, in figure 1.

In general, the price of an assetcan be represented by the following equation

$$P = l_1V_1 + l_2V_2 + l_3V_3 + \ldots + l_nV_n + e_1 + e_2 \qquad (1)$$

Where: P *is the market price*

l *is the weight given to the various intrinsic values derived by different valuation models*

e_1 *is the trading error; and*

e_2 *is the valuation error*

The valuation models which can be used include the methods previously cited (dividend discount, free cash flow) and newer approaches including residual income valuation (Ohlson(1995)) and Economic Value Added (Stewart(1990)).
EVA has been developed with a different focus, concentrating on 'economic' earnings, rather than the 'accounting earnings' upon which RI is based. It is also possible to use various multiples such as price-earnings, dividend yields, price-cash multiples and so on.

The lesson of strategic behaviour of companies, however, suggests that the pricing model in (1) is too limited. In particular, companies compete against existing and potential rivals. Valuation methods should incorporate such competitive strategies.
However, competitive analysis is often qualitative and case-specific. Subsequently, it has not been formally operationalised into valuation models or been formally tested. Practitioners, however, have often analysed the value of the firm in relative terms, incorporating both competitive advantages of individual firms as well as industrial characteristics.

This paper aims to establish a measurable framework for relative valuation models, and to consider an application to the automobile sector in Korea. Section 2 provides a brief review of the literature, Section 3 the theory and Section 4 an application.

2. A Review of Valuation Models

2.1. Single firm valuations

The intrinsic value is typically derived by estimating future payoffs and transforming those payoffs into a present value at the appropriate discount rate. They, albeit general, can be represented by the following equation:

$$V_{i,t} = \sum_{t=1}^{s} \frac{E_t(C_{t+s})}{(1+k_{t+S})^{s+t}} \qquad (2)$$

where: $V_{i,t}$ *is intrinsic value at t*

$E_t(C_{t+s})$ *is expected payoffs at t+s; and*

k_{t+s} *is the discount rate at t+s*

There have been several different valuation models developed in the valuation literature and they are classified by the definition of future payoffs and discount rates. The most prominent valuation models are:

1. *Dividend Discount Model* (DDM): where the future dividends are used as the proxy for the future payoffs and the cost of equity is used as the appropriate discount rate to derive the intrinsic value of the equity;
2. *Free Cash Flows Model* (FCF): where the future free cashflows are used as the proxy for the future payoffs and the weighted average cost of capital (WACC) is used as the appropriate discount rate to derive the intrinsic value of the total company, including equity and debt;

3. *Residual Income Model* (RI): where future excess accounting earnings are used as the proxy for the future payoffs and the cost of equity is used as the appropriate discount rate to derive the intrinsic value of the equity; and
4. *Economic Value Added Model* (EVA): where future economic value added are used as the proxy for the future payoffs and the WACC is used as the appropriate discount rate to derive the intrinsic value of the total company.

The principal motivation for valuations is to identify mispriced securities for investment purposes. For instance, Sorenson and Williamson (1985) have formed portfolios according to the degree of mispricing and found the considerable improvements of portfolio returns. A major problem is the forecasting of future cashflows. Most are based on earnings forecasts. There have been two branches of studies. The first branch of studies compared the analysts' forecasts with time series forecasts. For instance, Brown and Rozeff (1978) were first to document superior accuracy of analysts' forecasts over time series forecasts of quarterly earnings. Subsequent studies offered conflicting evidence. Notwithstanding the conflicting evidence, in recent years it is common practice to (implicitly) assume that analysts' forecasts are a better surrogate for market's expectations than econometric models (Kathari (2000)).

The second branch of studies analyses the composite forecasts where two or more forecasts are combined to produce another forecasts. They often combine the time series models of earnings that explicitly capture seasonality and cyclical movements of earnings and analysts' forecasts which collectively represent the market expectations. rates. Some studies have provided qualitative measures to forecast future earnings, including firm specific information that has been available since the last financial reports, competitive strategies relative to competitors *re* future prospects of the companies, industrial characteristics that may determine the long term growth opportunities, and macroeconomic information.

The general equivalence of these valuation models was been proposed theoretically by Miller and Modigliani (1961). This idea of general equivalence was further extended by Levin (1998) with the inclusion of corporate taxes. He concluded that in a world with corporate taxes, the general equivalence of the valuation models is achieved only when the company is expected to maintain a constant market debt ratio.

2.2 Relative valuations.

One of the most important factors determining the growth rate of cashflows is the competitiveness of a firm. Theories on competitiveness assert that the cost minimisation and/or product differentiation is the major factor in determining the

competitiveness of a firm and its profitability. For instance, M. Porter (1985) suggests that competitiveness of a firm is attributable to five factors: potential entrants, bargaining power of supplies and buyers, level of substitution and the level of industry competition. This proposition is supported by empirical research. For instance, Caves (1974), Wolf (1977), Dunning (1980) and Mishra and Gobeli (1998) found that the profitability of multinational firms is a function of product differentiation. One of the major implications of these studies is that the level of R &D and advertising expenditure can be used as proxy to estimate growth opportunities of the company in determining intrinsic values.

Industrial characteristics also determine the growth opportunities of firm profitability. Previous studies have found a weak but statistically significant negative relationship between industry concentration and profitability.

Investment opportunities, proxied by the industry q-ratio (the ratio of the market value to the book value) have also been found to be associated with industry profitability. Lang, Stulz, and Walkling (1991) and Mishra and Gobeli (1998) found a significant relationship between the industry q-ratio and industry profitability. These studies also analysed firm specific level and also found the significant relationship between q-ratio and profitability . Again, this has implications for valuation models.

3. A Theoretical Model of Relative Valuation

We consider the simultaneous determination of equity valuations for firms in the same industry. To make this empirically meaningful, we consider a number of cases beginning with the case when the valuations are observed, that is, when we have a time series of market valuations.

3.1 Observed valuations.

For simplicity, we assume an industry with 2 firms. The market return of firm i (i=1,2) is first assumed to be generated by its market valuation $V_{i,t}$, and that this effect is present next year (t+1) and in s years subsequent to the valuation.

$$\begin{aligned} R_{i,t} &= a_0 + a_1 V_{i,t} + e_{i,t} \\ R_{i,t+s} &= a_0 + a_1(s) V_{i,t} + e_{i,t} \end{aligned} \qquad (3)$$

It is expected that there is a positive relationship between observed valuation and returns, however the extent of impact of observed valuation to future returns are expected to decline over time. Hence, the coefficient, $a_1(s)$ is expected to be positive and decline as s increases.

The above equations can be extended by incorporating competitiveness and industrial characteristics, as the competitiveness and industry characteristics are expected to have significant impact on returns.

$$\begin{aligned} R_{i,t} &= a_0 + a_1 V_{i,t} + a_2 Comp_{i,t} + a_3 Ind_{i,t} + e_{i,t} \\ R_{i,t+s} &= a_0 + a_1(s) V_{i,t} + a_2 Comp_{i,t} + a_3 Ind_{i,t} + e_{i,t} \end{aligned} \qquad (4)$$

The coefficient on *competitiveness*, α_2 is expected to be positive, as increases in competitiveness results in higher profits and subsequently higher returns. The coefficient on the *industrial characteristics* is expected to have positive relationship with returns, as favourable industrial characteristics, such as higher industry growth opportunities, should lead higher returns. Furthermore, it is expected that *Industrial Characteristic* dominate future returns ($R_{i,t+s}$) as the industrial characteristic are the main contributors of long run growth of companies in the steady state.

Furthermore, relative valuations can be incorporated into return estimations as followings.

$$R_{i,t} = a_0 + a_1 V_{i,t} + a_2 Comp_{i,t} + a_3 Ind_{i,t} + a_4 V_{j,t} + e_{i,t}$$

$$R_{i,t+s} = a_0 + a_1(s) V_{i,t} + a_2 Comp_{i,t} + a_3 Ind_{i,t} + a_4 V_{j,t} + e_{i,t}$$
$$(R_{i,t}-R_{j,t}) = a_0 + a_1(V_{i,t}-V_{j,t}) + a_2 Comp_{i,t} + a_3 Ind_{i,t} + a_4 V_{j,t} + e_{i,t} \qquad (5)$$

Where: $R_{i,t}$ *is the continuously compounded return for the company i at t;*
$V_{i,t}$ *is the logarithm of the observed valuation of the company i at t;*
$Comp_{i,t}$ *is the competitiveness of the company i at t; and*
$Ind_{i,t}$ *is the industrial characteristics at t.*

It is expected that there is a positive relationship between the relative returns of the firms and the relative values of the firms.

3.2 Pseudo valuations.

In the absence of observed valuations, we construct pseudo valuations, based on traditional valuation models, such as the DDM, the FCF or the RI. In all the above equations (3)-(5), we replace $V_{i,t}$ by $V^*_{i,t}$.

An alternative approach is to incorporate factors that simultaneously determine returns without a particular reference to values, competitiveness or industrial characteristics. For instance, Choi (1995) incorporated exchange rates, retained earnings, cost of capitals and differences between cost of capital and earnings growth rate.

Then, returns are simultaneously estimated as followings:

$$R_{i,t} = a_0 + a_1 Ex_{i,t} + a_2 E_{i,t} + a_2 k_{i,t+s} + a_3 (k\text{-}g)_{i,t} + e_{t,t}$$
$$R_{i,t+s} = a_0 + a_1 E_{i,t+S} + a_2 E_{i,t} + a_2 k_{i,t} + a_3 (k\text{-}g)_{i,t} + e_{i,t}$$
$$(R_{i,t}-R_{j,t}) = a_0 + a_1 Ex_{i,t} + a_2 (E_{i,t} - E_{i,t}) + a_2 (k_{i,t} - k_{j,t}) + a_3 (k\text{-}g)_{i,t} + a_4 (k\text{-}g)_{j,t} + e_{I,t} \qquad (6)$$

Where: $R_{i,t}$ *is the continuously compounded return for the company i at t;*
$Ex_{i,t}$ *is the exchange rate at t; and*
$E_{i,t}$ *is the earnings of the company i at t;*

$k_{i,t}$ *is the cost of equity of the company i at t; and*
$g_{i,t}$ *is the earnings growth rates..*

The importance of the simultaneous and relative valuation models is the emphasis on economic factors such as measures of competitiveness, industrial characteristics, R&D, advertising on asset valuations, but also an emphasis on the strategic interaction of firms within an industry. We now proceed to consider the Korean automobile industry.

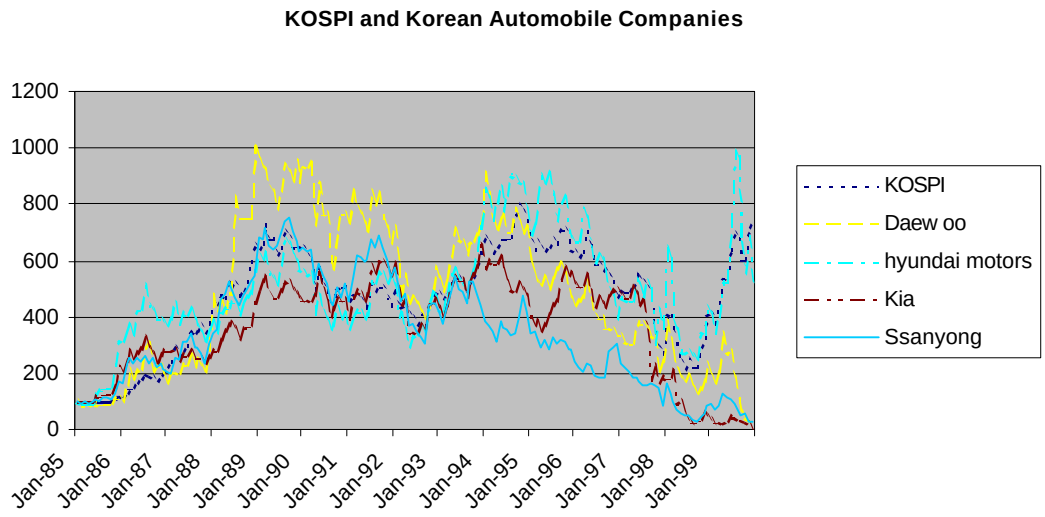
4. Korean Automobile Industry

4.1 a) Background:

Korea's automobile industry achieved annual production growth of 15% during the 1980's and early 1990's, principally attributable to continuous developments in technology and to diversification of model lines. These economies of scale and scope were accompanied by robust export growth and enabled Korea to be ranked sixth in global automobile production by 1993. However, the economic and financial crisis of 1997 induced a significant restructuring of the automobile industry. At present, there are 5 companies in the industry; Hyundai Motor, Daewoo Motor, Kia Motor, Ssayngyoung Motor and Renault-Samsung Motor.

The following graph, the graph1, shows the share price movements among selected automobile produces and KOSPI.

Graph 4.1.



4.1 b) data Availability (1990 – 2000)

The following table, the table 2, summarises the available data which are available from Korea Stock Exchange (KSE), analysts reports, and Korea Automobile Manufacturers Association.

Table 4.1.

Firm Specific information	Share Prices
	Observed valuation
	DPS, EPS, BPS
	Yearly and Half yearly financial statements (including R&D and advertising expenses) including notes
Industry Information	Yearly Productions
	Industry P/E, D/P
	Market shares

4.2 Other Applications: Internet Companies

There have been significant developments, especially since the early 1980s with the technological improvements. As a result, the corporations have been experiencing unprecedented growth opportunities, reflected upon their ever-increasing share prices, while the analysts were unable to appropriately make predictions for future earnings or risk premiums. One industry that has a particular interest is internet companies whose the total market value of which exceeds $1.3 trillion dollars (USD) from $50 billion over the last three years (Hand(2000)).

The speed with which the Internet is changing the business landscape has pre-empted structure description or economic analysis of net firms. This leads many interesting questions about the valuation of the Internet companies: how do we value these Internet companies which often have little or negative earnings, cashflows or dividens but have significant but uncertain growth potentials? How do we quantify this growth opportunities ?

One approach to measure and hence value the Internet companies to analyse non-financial information, such as number of hits or number of web-page updates. Alternative approach is to analyse the decomposition of financial information, in particular, intangible assets such as patents, brand names and goodwill. However, these approaches have not been substantiated and period-specific, given the rapid changes in the Internet environment.

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Glossary

Terms:	**Notations**	**Meanings:**
Dividend Discount Model	DDM	the future dividends are used as the proxy for the future payoffs and the cost of equity is used as the appropriate discount rate.
Free Cash Flows	FCF	the future free cashflows are used as the proxy for the future payoffs and the weighted average cost of capital (WACC) is used as the appropriate discount rate.
Residual Income Model	RI	future excess accounting earnings are used as the proxy for the future payoffs and the cost of equity is used as the appropriate discount rate
Economic Value Added	EVA	future economic value added are used as the proxy for the future payoffs and the WACC is used as the appropriate discount rate.
Book to Market ratio	B/P	Per share book vale to market value ratio
P/E ratio	P/E	Per share price to earnings ratio
Dividend Yield	D/P	Per share, dividend to price ratio
Price	P	Market prices
Observed Valuation	$V_{i,j}$	Observed Intrinsic value.
Discount rate	k_t	Discount rate reflecting the appropriate risk
Return	$R_{i,t}$	Continuously compounded Return on share i, at time t
Competitiveness	Compi,t	Competitiveness of firm i, at time t
Industrial Characteristic	Indi,t	Industrial Characteristic of industry I, at time t.
Pseudo Valuation	V*i,j	Derived intrinsic value according to fundamentals.
Exchange rate	Ext	Cross exchange rate between two countries.
Growth rate	$g_{i,t}$	Steady state growth rate.
m-firm concentration ratio	$\boldsymbol{R_m}$	**adds up the m highest shares in the industry**
the Herfindahl index	R_H	the sum of the squares of the market shares
the Entropy index	$\mathbf{R_e}$	**the sum of shares times their logarithm:**