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The Continuing Transformation of Asahi Glass: Implementing EVA

Toshiya Iwasaki, who founded our company in 1907, succeeded in Japan's first commercial manufacturing of flat glass after numerous failures. He used to say, "Never take the easy way out, but confront difficulties." He built the corporate culture to challenge the most difficult problems.

—Shinya Ishizu, President and CEO

Shinya Ishizu was in a difficult situation of his own devising. As president and CEO of Asahi Glass Company (AGC), he presided over a Japan-based multinational manufacturer of flat glass, chemicals, and electronics and displays, with annual sales of ¥1.3 trillion and the largest global market share in most of its product categories. Worldwide, AGC controlled a network of over 200 subsidiaries and affiliates in 25 countries, generating ¥52.4 billion in overseas operating profits in FY2003—sixth largest among all Japanese companies.[1] (See **Exhibit 1** for financial information and **Exhibit 2** for AGC's global presence.)

After he was appointed president and CEO in 1998, Ishizu began implementing a number of drastic changes to the company's structure and corporate culture in order to create a truly international enterprise. In 2002, he split AGC into four business units on a global basis which were dubbed "in-house companies" and appointed two non-Japanese executives to manage the glass business, which, at 53% of total sales and 56% of operating profits, was the core of the company. Many Japanese employees working for the company in Japan were placed under non-Japanese bosses for the first time, and many had to learn English.

This reorganization was accompanied by equally drastic reforms in corporate governance and the introduction of new management system for resource allocation and performance measurement based on economic value added (EVA). EVA had been introduced at AGC's Japanese operations in 1999 aiming at maximization of shareholders' value. However, Ishizu believed that drastic reforms had not been embraced widely. While younger and overseas staff accepted the changes, there was strong resistance from senior executives, who took comfort in AGC's traditionally strong position in the marketplace and who did not see the need to tamper with the present winning formula. Ishizu realized that the corporate culture of AGC, which had been 100 years in the making, would be difficult to change, and worried that a

[1] "Overseas Profits of Japanese Companies Rose 46%," *Nikkei Economic Journal*, June 19, 2003. As of November 30, 2003, the exchange rate was ¥109.50/$. FY2003 represents a year from April 1, 2002 to March 31, 2003.

Professor Mihir A. Desai and Masako Egawa, Executive Director, Japan Research Office, and Research Associate Yanjun Wang prepared this case. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

reaction by the old guard would jeopardize both his reforms and the future growth of the company. In November 2003, as he thought about his successor, he believed it was critical that he should ensure that AGC's reforms and transition to a truly international enterprise should be embraced by all the executives and employees. He wondered how he should change the mindset of executives and employees and reform the management system to fit with AGC's operations, which were extremely diverse in terms of products as well as geography.

Overview of Asahi Glass Company

Around the turn of the 20th century, Toshiya Iwasaki (a nephew of the founder of Mitsubishi Group) chose to ignore the advice of his family and began experimenting with the industrial production of flat glass. At the time, nobody in Japan—including the government—had succeeded in producing flat glass.[2] In 1907, Iwasaki founded AGC and two years later, after nearly ten years of trials, began the production of flat glass. (See **Exhibit 3** for AGC's history.)

As the Japanese economy boomed in the aftermath of World War II, the demand for glass skyrocketed, especially in the construction, television-manufacturing, and automobile industries. By the early 1950s, AGC was producing automotive glass[3] and CRT (cathode ray tubes) glass bulbs for televisions. In 1956, the company established its first overseas company in India, manufacturing flat glass, and during the 1960s and 1970s expanded international operations by building manufacturing plants in Thailand, Indonesia, Singapore, and other Southeast Asian countries.

During the 1980s and 1990s, AGC expanded its reach by making inroads into the European and U.S. markets. In 1981, AGC purchased two companies from French conglomerate BSN (which was exiting the glass business); Glaverbel, a Belgian company; and MaasGlas, a Dutch company. In 1992, the acquisition of U.S.-based AFG Industries finally gave AGC a presence in all the major world markets.

In 2003, AGC's sales consisted of glass products (54% of sales), electronics and displays (24%), chemicals (19%), and other products (3%). In most product categories, AGC was either the market leader or second largest among global competitors. AGC accounted for 21% of the flat glass market and 30% of the automotive glass market. While display and electronics products accounted for 24% of sales, this segment accounted for 41% of operating profits, and it continued to grow rapidly. AGC was the world leader in CRT glass bulbs, with a 32% market share, and had a commanding 90% share of the PDP (plasma display panel) glass substrates market. Manufacture of chemicals such as fluorinated resins, soda ash, caustic soda, propylene oxide, and sodium bicarbonate accounted for 19% of total company sales, but incurred operating losses in 2002. The remainder of AGC's sales came primarily from ceramics. (See **Exhibit 4** for the segment information and **Exhibit 5** for market shares of glass products.)

AGC's global competitors in the glass trade included Saint-Gobain in France, Pilkington in the U.K., and Guardian in the U.S. Its domestic competitors, such as Nippon Sheet Glass and Central Glass, were substantially smaller.

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[2] Flat glass is primarily used for construction and automotive glass materials and includes float glass, sheet glass or plate glass.

3 Automotive glass is manufactured through cutting and fabricating by tempering or laminating flat glass.

Finance Function

Relationship with Banks

During the 1960s and 1970s, banks acted as the major providers of debt capital to AGC (as well as to many other Japanese companies) since the domestic capital market was not well developed. In Japan, the bank having the strongest relationship with the borrower was called the "main bank" and kept the largest amount of loans outstanding to, and equity interest in, the borrower. The main bank sometimes assumed the responsibility of monitoring the performance of the borrower on behalf of all the lenders, selectively intervening if the company's performance deteriorated.

The banks and corporations typically had cross-shareholding arrangements, owning small minority interests in each other. The implicit agreement was that each party would vote for the management at general shareholders' meetings and would not sell those shares without obtaining agreement from the other party (issuer). Some corporations invited senior bank managers as executive or non-executive board members. Being a member of Mitsubishi Group, AGC's main bank was Bank of Tokyo-Mitsubishi (BOTM). Historically, the bank was the seventh-largest shareholder of AGC with 3.8% interest. AGC simultaneously owned 0.9% of Mitsubishi Tokyo Financial Group, BOTM's holding company. At the peak in early 1990s, Mitsubishi Bank (predecessor of Bank of Tokyo-Mitsubishi) owned 4.9% of AGC and AGC owned 1.5% of the bank. According to Takashi Matsuzawa, CFO and director, "the main bank used to act as the *'stable shareholder,'* which understood AGC's business and supported our management."

The troubles that plagued the Japanese economy in the 1990s—particularly the bad debt problems and the banking crisis—had a significant impact on the main bank system. Banks began to sell their stock portfolios to compensate for losses from bad debt (by realizing latent gains) and to reduce the volatility of earnings and capital.[4] Sales of equity holdings by both banks and corporations greatly reduced cross-shareholding: from 1991 to 2001, the percentage of cross-shareholding against the total market value of listed companies in Japan fell from 17.8% to 8.9%.

As Japanese capital markets became increasingly deregulated in the 1980s, Japanese companies including AGC began to use capital markets more actively. Takashi Matsuzawa commented on the change in the relationship with its main bank: "the main bank relationship meant a lot in the old days. But today the meaning of cross-shareholding has changed completely. I would like to divest those cross-shareholding shares and shrink our balance sheet." As the yield of cross-shareholding shares were around or less than 1%, investors did not want to see too much of the company's resources tied up with such low-yielding assets.

As of March 31, 2003, AGC held ¥137.5 billion in corporate stock, down from ¥224.5 billion the year before. During the year ending March 31, 2003, the company incurred ¥44.2 billion in losses on write-down of investments in securities, most of which were bank shares. (See **Exhibit 6** for the stock price performance of AGC and banks.)

In November 2003, AGC announced that its shares held by banks, which accounted for 6.1% of AGC's outstanding stock, would be sold in the public market. In return, AGC planned to sell its holdings of bank shares, including those of BOTM, thereby reducing its cross-shareholding.

[4] Japanese banks were allowed by the Bank for International Settlements to include 45% of latent gains from equity holdings when calculating bank capital.

Raising Funds through Capital Markets

When AGC began investing in Southeast Asia in the 1960s, it relied upon loans from Japanese banks to fund the overseas operations. During the 1970s AGC began to raise funds in overseas markets such as Switzerland and Germany to fund its international operations. As the company expanded internationally, it realized the importance of capital markets and in 1983 obtained S&P ratings. Makoto Seki, director, finance division, explained how operations in each region were financed in 2003:

> In the U.S., operations are primarily funded by commercial paper (CP) and medium-term notes (MTNs) issued by a finance company. In Europe, 95% of funding is handled by a finance company, but through bank loans. In Japan the parent company issues CP and gives the proceeds to a finance company, which in turn on-lends to subsidiaries. In Asia outside Japan, we established a finance company in Singapore which is still small. Most of our Asian subsidiaries are borrowing from banks. Some of them are borrowing from Japanese banks, which are willing to treat them as AGC parent credit. So the main bank relationship is still very important for us.

Decentralized Funding Decisions

When AGC acquired Glaverbel in 1981, the company felt Glaverbel's operations were too large relative to AGC as a whole. AGC management hoped to take Glaverbel public after its turnaround to minimize the financial risk. Therefore, when Glaverbel management proposed an IPO in 1987, AGC management supported it even though the attendant dilution of earnings was not welcome from the parent company's viewpoint. The acquisition of AFG Industries in 1992 presented even bigger risks for AGC. AGC encouraged all of its major subsidiaries to manage their companies without relying on the parent company's credit.

Concerns about financial risk led senior management to decide to make each regional operation autonomous within the tri-polar organization of Japan/Asia, Europe and U.S. In addition, Japanese accounting rules which focused on the parent company skewed the attention of Japanese managers away from the international operations, since overseas operations were handled by subsidiaries and their financial performance did not impact the parent company's non-consolidated financial statements. It was only in 2000 that the primary financial statements for all Japanese listed companies were changed from a non-consolidated basis to a consolidated basis, even though consolidated statements had been required since 1978. Accordingly, senior managers as well as external parties such as the investors had considered non-consolidated results more important. Takashi Matsuzawa, CFO and director, commented, "the financial staff like us always had a pretty good idea about the cash flow position and creditworthiness of the entire AGC group, but senior management focused on the parent company until the late 1990s, when the regulation was changed and consolidated financial statements became the primary requirements for all Japanese companies."

Credit Ratings and Debt Position

AGC was accorded an A2 rating from Moody's and an A- from S&P. The amount of total company debt declined from ¥735 billion as of March 31, 2002 to ¥686 billion as of March 31, 2003, but management planned to reduce the debt further (an additional ¥150 billion) to maintain favorable ratings. According to Hideki Goto, vice president, investment grade research, Goldman Sachs (Japan) Ltd.:

> AGC's credit is a combination of conservative business risk and better-than-average financial risk. AGC controls 41% of the domestic sheet glass market and is part of an oligopoly which has lasted for the past few decades. The company is also No. 1 globally. But it is shifting its business

portfolio towards higher risk/higher growth potential as it allocates more resources to electronics and display products.[5]

It was unclear if those credit analysts welcomed AGC's focus on display and electronics business which led to higher risk. They believed that higher business risk had to be offset by more conservative financial profile in order for AGC to maintain the overall credit quality.

Reorganization and Value Creation Management

Prior to the 1990s, management had assessed the performance of each AGC subsidiary separately. However, it had become increasingly clear that coordination across national borders and product lines — assessing the performance of each company *as a part of AGC group* — was an essential step toward efficiently managing and optimizing the value for each business. Automobile and electronics companies, which were important customers for automotive glass and display business, respectively, had become increasingly global and demanded consistent service on a global basis. Global auto giants such as GM and Toyota asked for a single price for automotive glass, be it in Kentucky, Spain or Thailand. Consequently, in 1998 AGC implemented a strategy to focus on company performance as a whole. In the same year, AGC launched a "Shrink to Grow" strategy in response to weak domestic performance and the Asian economic crisis of the previous year. These paired strategies aimed at *selective* and *focused* allocation of resources among the various businesses in AGC's portfolio.

In 1999, AGC introduced in Japan a measurement system similar to economic value added (EVA) aimed at assessing the performance of each business unit, and linked the bonuses of managers and executives to these measures to provide proper incentives.

As a further change, AGC's resource allocation process was made a regular part of the company's three-year mid-term planning cycle. As each SBU prepared its mid-term plan, including investment and free cash flow projections, AGC ranked each business based on its fit with overall corporate strategy and its contribution to the value of the firm. The company aimed to fashion a "value portfolio" by selectively committing resources based on these rankings. According to Takashi Terashima, executive officer, general manager and corporate controller, "Flat panel display is ranked as *core*, electronics as *hope*, flat and automotive glass as *opportunistic*."

In April 2002, AGC announced a new group vision of "Look Beyond," an initiative aimed at clarifying shared value (innovation and operational excellence, integrity, diversity and environment) and providing long-term direction beyond the usual three-year planning cycles, and proposed further reorganizations to implement the change. Ishizu assembled a project team to draft the new group vision, handpicking 13 middle managers in their late 30s and early 40s. The reorganization encompassed three distinct changes: (1) the creation of in-house companies on global basis; (2) corporate governance reform; and (3) the definition of group corporate and business operating functions.

Creation of In-House Companies

AGC had traditionally been organized and operated along geographical regions, and management in Tokyo had respected the autonomy of U.S. and European operations. In 2002, the company established four "in-house companies," organized along product lines to foster international coordination. The intention for this change was to allow AGC to more effectively cater to major customers, including global

[5] Hideki Goto, vice president, investment grade research, Goldman Sachs (Japan) Ltd, interview by casewriter on July 3, 2003, Tokyo.

players in the automobile and electronics industries. Two non-Japanese executives were appointed as heads of in-house companies: Luc Willame, CEO of Belgian-based Glaverbel S.A., became president of Flat Glass Company; and Jay Strong, an American who headed AP Technoglass (a subsidiary of AFG Industries, Inc. in the U.S.), became president of Automotive Glass Company. As previously mentioned, these companies together accounted for 55% of sales and 56% of AGC's operating profits. (See **Exhibit 7a** for global management structure for glass business and **Exhibit 7b** for establishment of four in-house companies.)

Commenting on the reason for the changes, Ishizu remarked, "the market and customers for most of our products are global. So we have to coordinate ourselves globally and face our customers with 'one voice.' We now have to form a scrum among 50,000 employees globally; we are now together." Ishizu often used the word "cross-fertilization" to encourage employees from different countries to communicate closely and learn from each other. Masayuki Kamiya, director, corporate planning, explained, "the objectives of the global organization were delegation of authority, and quick decision and implementation of strategies." Ishizu, pleased with the outcome of the global reorganization, commented: "both [Luc and Jay] make quick decisions, expediting the decision making for our company. They demand clear accountability from their subordinates. Their appointment shook up the Japanese managers who were taking it easy, which was exactly what I intended."[6]

Jay Strong, senior executive officer and president of Automotive Glass Company, shared his experience: "AGC used to be a federation of regional operations. Now it is a global, integrated organization. Since reorganization, we have not experienced any *inter-regional* conflicts, although there are many *intra-regional* ones, such as how to coordinate strategy and marketing." However, it might take time for AGC to fully implement the strategy and reap the benefits of the reorganization. Yusuke Ando, senior analyst at the Daiwa Institute of Research, sounded a cautionary note from the market perspective: "equity analysts wanted to see more stepped-up restructuring through the global reorganization, but it has not happened."[7]

In the wake of these changes, some managers began to feel uneasy about the scope of the decisions being left up to in-house companies and felt that inter-company communication about such decisions was not enough of a priority. For instance, upon reorganization, each in-house company was given the authority to make investment decisions of up to ¥5 billion, five times the earlier limit. Strong found the ¥5 billion limit had expanded authority "staggeringly." Takashi Matsuzawa, CFO and director, expressed his views:

> We aim to treat each in-house company as independent. Delegation of authority to in-house company forces its president to become responsible for the division's capital structure and credit risk in the same way as AGC group CEO is responsible for those issues to the external market. This system will bring up excellent managers. But there is a risk that some presidents, who may not fully understand AGC's financial position, could make a decision which has significant impacts on the overall creditworthiness of the company. Group corporate is expected to act as a judge or an internal investor; sometimes in-house companies' decisions are restricted through the AGC group medium-term planning conference.

Takashi Wada, senior executive officer and general manager, corporate planning, described two major difficulties AGC faced:

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[6] "Industrial Power: Milestone for Revival and My Opinion (Interview with Shinya Ishizu, President and CEO, Asahi Glass), *Japan Economic Journal*, December 17, 2002, p. 17.

[7] Yusuke Ando, Daiwa Institute of Research senior analyst, interview by casewriter on July 3, 2003.

First, conflicts with minority shareholders. AGC had established a lot of joint ventures when we went into new overseas markets. As we began to manage business regionally and globally, however, we faced increasing conflicts of interests with local partners. For instance, it was not always easy for AGC to optimize manufacturing operations in Asia because local partners tended to pursue profits for each local company. To resolve such conflicts, we bought out the interests held by our partners. Second, communication. To facilitate communication globally, we need to rely on more in-depth, frequent communication and relocation of people across regions.

Shukichi Umemoto, director, tax and accounting division, pointed out another problem:

The accounting system within AGC has not been standardized yet; Japanese operations are accounted for based on Japanese GAAP, U.S. operations on U.S. GAAP, and European operations on Belgian GAAP. The treatment of certain items differs significantly among three principles, creating inconsistency in decision making and performance evaluation across regions. These three GAAPs are headed in the direction of convergence. AGC should harmonize those three GAAPs until convergence is achieved.

Corporate Governance Reform

AGC implemented a series of reforms to separate execution and oversight of management. The company reduced the board of directors from 20 members to seven, and appointed two independent directors[8]. Many former board members became executive officers. Additionally, four of AGC's 22 executive officers, including Ishizu, continued to serve on the board as well.

AGC was at the forefront of the corporate governance reform among Japanese companies. Traditionally the boards of Japanese companies including AGC had been dominated by insiders. At the end of 2002, less than one third of listed companies appointed external directors, but about half of those companies had only one such director,[9] whereas AGC had two out of seven.

Delegation of authority to in-house company presidents allowed the board to narrow their focus to a few strategic issues. According to Takashi Wada, senior executive officer and general manager, corporate planning, "the number of agenda items declined from more than 10 to several key items. It allows us to have more in-depth discussions on each topic. Now our board meetings start at 9:30 but sometimes run through lunchtime."[10] The board meetings were held at least once a month.

In June 2003, AGC established a four-person nominating committee to oversee the executive succession process. The committee was structured so as to always include the two independent directors. This was again a departure from standard Japanese business practice: the majority of Japanese companies did not have nominating committees, and presidents picked their own successors.

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[8] Haruo Shimada (professor at Keio University) and Kakutaro Kitashiro (then president of IBM Japan) were appointed as external directors. Hiromichi Seya, former president of AGC, who was not an executive director, served as chairman of the board.

[9] The survey conducted by the Tokyo Stock Exchange (65% of 2,103 companies responded) indicated 29% of the respondents appointed external directors. Of those companies which had external directors, 52% had one and 25% had two external directors. (Source: Tokyo Stock Exchange, "The Results of the Survey on Corporate Governance," January 27, 2003.)

[10] "A Managerial Analysis: Asahi Glass," *Diamond Weekly*, April 12, 2003, p. 57.

Defining Group Corporate and Business Operating Functions

AGC carefully delineated *group corporate* functions and *business operating* functions. Group corporate was charged with oversight of each *business operating* organization, allocation of management resources, providing a common management platform, and developing new businesses — essentially acting as the framework within which in-house companies and SBUs functioned. Within this framework, in-house companies and SBUs assumed *business operating* functions and were given greater autonomy than they had previously enjoyed, with the expectation that this freedom would allow the unit to maximize the value of its constituent businesses. Group corporate would act as an "investor" within the company, diverting resources strategically as a given unit demonstrated its potential to create value. The resource allocation decision was extremely important as AGC operated a diversified portfolio of businesses.

Masayuki Kamiya, director, corporate planning, explained:

> The functions of group corporate consist of global corporate service and regional shared service. The former includes such functions as strategic planning, financial control, finance, investor relations, communication, group human resources management, and new business development. The latter is an integral part of operating divisions and includes such functions as purchasing, accounting and human resources management. The expenses of global corporate service are not charged to each business unit while the expenses of regional shared service are charged to operations.

Takashi Terashima, executive officer, general manager, corporate controller, mentioned that there is a possibility that *group corporate* "will ultimately become a holding company. If AGC forms a holding company, the advantage is to be able to implement a different compensation system for each company by tying the bonuses to individual performance. But the shareholders ultimately decide our organizational structure."

As finance functions were centralized under the new structure, corporate management saw an opportunity to consolidate and streamline tasks such as financing, tax management and insurance. These matters had previously been arranged within each region, an approach that naturally did not minimize costs to the company as a whole.

Of these, tax management seemed the most promising area to generate savings. AGC appointed the European tax manager based in Belgium to the role of global tax coordinator, as he already had extensive experience managing pan-European tax issues for Glaverbel. He, along with each regional tax manager and Matsuzawa's staff in Tokyo, set out to optimize the company's worldwide tax.

Under the new organization, each in-house company became responsible for its own EBIT and operating assets, and EVA, and incentives of senior managers were tied to these performance measures. The bonuses for in-house company presidents were determined based on one-year operating profits, but investors scrutinized top management for both short-term and long-term financial performance. Some executives worried about possible inconsistencies between Ishizu's stated objectives and those of in-house company presidents. There were heated discussions within AGC whether each BU should be responsible for EBIT and operating assets as well as capital structure decisions. Some were concerned that BU managers, who might not be familiar with AGC's credit standing, could make significant investment decisions which might negatively affect the company's overall capital structure and credit ratings and argued that asset allocation and capital structure decisions should be left with group corporate.

AGC began to globalize human resources management as well, selecting about 100 senior managers and 200 "high potential" middle managers to train as candidates for future leadership. About 30% of these candidates were non-Japanese. This was consistent with the management's expectation that the

percentage of Japanese employees at AGC, currently about 30% of total, would in 10 years decline to about 6%. Such a plan was revolutionary within Japanese business culture, which had long placed a high premium on retaining as many Japanese employees as possible, and fostering career-spanning relationships with them. Consequently, this strategy dismayed Japanese managers, who felt that with this strategy, AGC was choking off their future with the company.

Using EVA at Asahi Glass

In 1999, AGC implemented EVA as a tool for resource allocation as well as for performance evaluation for managers and above. It was calculated using the formula:

$$EVA = NOPAT - CE \times WACC$$

NOPAT : Net Operating Profit After Tax

CE : Capital Employed

WACC : Weighted Average Cost of Capital

The 22 executive officers were evaluated based on improvement in EVA calculated using a WACC of 8%, which was the weighted average of country WACCs.

In practice, EVA rate instead of EVA was mapped to manager bonuses using a seven-grade rating system. This did not reflect properly the fundamental profitability of each company.

$$EVA\ Rate = NOPAT / (CE \times WACC)$$

Hence, an EVA rate of 1 is equivalent to an EVA of 0. About 1,400 lower level managers in Japan were evaluated based on the absolute EVA calculated using a WACC of 5%, which was based on the cost of capital in Japan in 1999. They planned to use 8% for the lower level managers as well starting 2004.

Calculating WACC for Each Country

WACC Formula

$$WACC = (1-t)R_d \frac{D}{D+E} + R_e \frac{E}{D+E}$$

t: Tax rate

R_d: Cost of debt

R_e: Cost of equity

D: Amount of debt

E: Amount of equity

WACC measured the cost of capital using the weighted-average cost of debt and equity. Since interest payments are tax deductible, the cost of debt was reduced by the corporate tax rate.

Debt-to-Equity Ratio

A target debt-to-equity ratio of 0.7 was applied across the board for book-value basis as well as market-value basis as the assumption for the capital structure in order to reflect the company's medium-term plan. Since D/E was 0.7, one could calculate D/ (D+E) and E/ (D+E) by assigning E a value of 1 and D a value of 0.7. Therefore, for all countries:

D/(D+E) = 0.7/(0.7+1) = 0.41

E/(D+E) = 1/(0.7+1) = 0.59

Deriving Cost of Debt and Cost of Equity

Industrialized Countries

In industrialized countries, the local currency was used for the calculations. The cost of debt was calculated by adding the risk-free rate in each country based on the information provided by *Financial Times* to a credit spread of 100 basis points (a ballpark figure). Therefore, $R_d = R_{risk\text{-}free}$ + Credit Spread, where credit spread is 100 basis points.

The cost of equity was calculated using the CAPM model by adding the risk-free rate to the product of a beta[11] and the market premium based on the information provided by Ibbotson. Therefore, $R_e = R_{risk\text{-}free}$ + Beta x Market Premium.

Emerging Markets

In emerging markets, the U.S. dollar was used for the calculations.

[11] Beta is a measure of volatility of a stock relative to the overall market.

The cost of debt was calculated by adding the U.S. 10-year Treasury Bond yield, a credit spread of 100 basis points (again, a ballpark figure), and the country risk premium. Therefore, R_d= U.S. 10-year TB yield+ Credit Spread+ Country Risk Premium, where credit spread is 100 basis point.

The cost of equity was estimated based on the information provided by Ibbotson and JP Morgan. CAPM was not very useful here due to the lack of historical information on the stocks.

Exhibit 8 illustrates the WACC calculation for each country.

Country Examples

Two examples of the calculations of the country WACCs performed by Michitoshi Yamada, manager at corporate controller, are as follows:

1. Industrialized Countries—Japan

   $R_d = R_{risk\text{-}free}$ + Credit Spread = 0.84%[12] + 1.00% = 1.84%

   $R_e = R_{risk\text{-}free}$ + Beta x Market Premium = 0.84%[13] + 1 x 5.4%[14] = 6.24%

   Tax rate in Japan = 42.05%

   ⇨ $WACC_{Japan}$ = (1 - 42.05%) x 1.84% x 0.41 + 6.24% x 0.59 = 4.1%[15]

2. Emerging Markets – Indonesia

   R_d= U.S. 10-year TB yield+Credit Spread+Country Risk Premium = 4.2% + 1.00% + 6.0%[16] = 11.2%

   R_e= (28.9% + 15.9%) / 2 = 22.39%[17]

   Tax rate in Indonesia = 30%

   ⇨ $WACC_{Indonesia}$ = (1-30%) x 11.2% x 0.41+ 22.39% x 0.59 = 16.4%[18]

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[12] The company used the number provided by *Financial Times*. See **Exhibit 8**, under Japan for Risk-Free Rate (long-term).

[13] The same as 12 above.

[14] The company used the number provided by Ibbotson. See **Exhibit 8**, under Japan for Market Risk Premium.

[15] Rounded to 4%.

[16] The company calculated the country risk premium based on JP Morgan Discount Rates.

[17] The company used the information provided by JP Morgan and Ibbotson in this calculation. See **Exhibit 8**, under Indonesia for Equity Cost, Ibbotson, JP Morgan and Average.

[18] Rounded to 16%.

Calculating WACC for Each Business Unit

Glass Business

AGC calculated the WACC for each BU of their glass business based on the weighted average of the WACC of each country in which a given business unit operated. For instance, the WACC of the flat glass business in Asia was 10.0%, which was a weighted average of the WACCs of Japan, China, Indonesia, Philippines, and Thailand. (See **Exhibit 9a** for WACC calculations for Asian flat glass business.)

The cost of capital for each country used in this calculation was derived by modifying the cost of capital shown in **Exhibit 8**. The corporate controller took the average of the costs of capital of countries from **Exhibit 8** for countries in each country risk categories developed by Rating and Investment Information, Inc. (R&I), a Japanese rating agency. For instance, countries such as Indonesia and Vietnam belonged to category D, and the average cost of capital of category D countries was approximately 15%. Therefore, 15% was used for all countries which belonged to category D. Similarly, 13% was used for category C countries such as China and Mexico, and 10% for category B countries such as Korea and Taiwan. For most industrialized countries or category A countries, the cost of capital was around 7%. Accordingly, 7% was used as the cost of capital for Japan, instead of 4% (the number shown in **Exhibit 8**). This was consistent with the general view that the current risk free rate of 0.8% was unusually low and that the historical risk free rate was around 4%.

In contrast, the WACC of AGC's flat panel display business was 7.4%. (See **Exhibit 9b** for WACC calculations for flat panel display business.) The difference was due to the fact that 46% of the capital employed in Asia by the flat glass business was in emerging markets with high WACCs, such as Thailand, Indonesia and Philippines, whereas 88% of the capital employed by the flat panel display business was in Japan with a relatively low country WACC of 7%. (**Exhibit 9c** indicates the WACC of each division.)

Non-glass Businesses

For other (non-glass) businesses whose operations were primarily based in Japan, the WACC for Japan was used when calculating EVA. For instance, electronics and building materials were both assigned Japan's WACC of 7%. Initially, AGC calculated the cost of capital using the beta reflecting the risk of each business, but did not find meaningful difference across diverse business lines and resorted to the current method.

In the 18 major countries where AGC had substantial operations, WACC ranged between 7% and 15%, and tax rates ranged between 22% and 42%. At the in-house company/SBU level, WACC ranged between 7% and 10%, and tax rates between 35% and 42%. (**Exhibit 10** tabulates the WACCs and tax rates of major countries and SBUs).

Beta

In calculating beta for the company as a whole, AGC used the average beta of foreign glass companies such as San-Gobain, Pilkington and PPG, and also gave attention to global materials companies such as Bridgestone, Shin-Etsu Chemical and DuPont. AGC believed that the betas of domestic glass companies such as Nippon Sheet Glass and Central Glass (which held 33% and 27% of the Japanese flat glass market, respectively) were irrelevant as these companies were less global and less diversified than AGC. (**Exhibit 11** shows an analysis of the competitors.) Deriving an unlevered beta of 0.7 from the average of six global

materials companies and levering it by debt-to-equity ratio of 0.7, AGC used a beta of 1.0 throughout its WACC calculations.

Advantages and Shortcomings of EVA

The introduction of EVA immediately provided AGC with several advantages. For instance, all managers were more aware of the efficiency of capital and hence more sophisticated in resource allocation. EVA also made it easier to compare investment results from various countries. In the past, AGC had tended to over-invest in emerging market countries, since investment projects had been evaluated based on the deceptively low hurdle rate.

However, EVA was no magic bullet. Many managers remained unpersuaded as to its worth, and therefore did not refer to it when making decisions. This was true at all levels: even senior management, who had made the decision to introduce EVA, still relied on operating profits to evaluate the performance of in-house companies and for developing medium-term plans. Moreover, use of EVA as a performance-evaluation measure was limited to executive officers and employees of the parent company, approximately 2.5% of the total work force. Even in these cases, EVA ended up competing with other, older measures, such as cash flow, rather than being the sole evaluator of performance.

Some managers continued to hold fast to the belief that cash flow was more appropriate tool for resource allocation and performance evaluation. The company was keen to improve its debt-to-equity ratio and ratings, and some felt management should focus on cash flow in the short run. Compared to conventional measures such as cash flow or ROE, EVA did not provide suitable performance targets which could be used for communication with investors.

Conclusion

Speaking on the trials he faced in implementing the reform and transformation of AGC group, Ishizu commented:

> Our corporate creed says, "Never take the easy way out, but confront difficulties." But we have lost the challenging spirit. Now our culture is, "Never take the difficult way out." This is the revenge of our past success.[19]

Through the mid-1980s, AGC had experienced decades of rapid growth, enjoying the benefits of oligopoly in both the domestic and international markets. Looking back on his efforts, Ishizu admitted that he had underestimated how difficult he would find it to transform the culture of a large, successful company with a century-long history. Now five years into a six-year expected term (at AGC, presidents traditionally retired after six years), he commented on his situation:

> My biggest concern is how to make all employees embrace the change. We have already crossed the Rubicon and there is no going back. So we must develop a culture to ensure transformation.

Ishizu's main objective was to implement a mechanism that would allow AGC to continually adapt itself to an ever-changing global business environment. He was asking himself how such a mechanism might be implemented.

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[19] "Interview by Editor-In-Chief: Shinya Ishizu, President and CEO, Asahi Glass," *Diamond Weekly*, October 25, 2003, p. 128.

Exhibit 1 Financial Information

Consolidated Statements of Income (in ¥ millions)

	For the Year Ended:		
	3/31/01	3/31/02	3/31/03
Net Sales	**1,312,829**	**1,263,196**	**1,295,011**
Cost of Sales	**971,893**	**975,488**	**1,000,501**
Selling, General & Administrative Expenses	**229,283**	**228,720**	**227,034**
Operating Profit	**111,652**	**58,988**	**67,475**
Nonoperating Income			
Interest and dividend income	5,374	4,107	4,675
Gain on sales of marketable securities	--	--	--
Equity in earnings of nonconsolidated subsidiaries and affiliates	4,855	3,428	4,234
Other nonoperating income	4,677	7,909	5,900
Total Nonoperating Income	**14,908**	**15,445**	**14,811**
Nonoperating Expenses			
Interest expenses	24,268	22,252	16,634
Other nonoperating expenses	4,265	7,710	8,889
Total Nonoperating Expenses	**28,534**	**29,963**	**25,524**
Recurring Profit	**98,026**	**44,470**	**56,761**
Extraordinary Profit			
Gain on sale of fixed assets	6,425	5,884	15,332
Gain on sale of investments in securities	10,411	4,132	6,823
Gain on sale of investments in subsidiaries and affiliates	1,762	--	--
Gain on establishment of trust for retirement benefits	75,506	--	--
Others	6,933	3,735	6,782
Total Extraordinary Profit	**101,039**	**13,751**	**28,937**
Extraordinary Losses			
Loss on disposal of fixed assets	9,706	11,470	12,403
Exchange loss	6,524	--	--
Loss on sale of investments in subsidiaries	--	4,191	63
Loss on valuation of investments in securities	3,125	2,004	44,220
Loss on restructuring programs	13,917	42,294	18,720
Charge for full amount of transitional obligations for retirement benefits	84,256	--	--
Others	21,102	5,913	4,556
Total Extraordinary Losses	**138,632**	**65,874**	**79,964**
Net Income (Loss) Before Taxes	**60,433**	**(7,652)**	**5,734**
Taxes	**20,761**	**13,613**	**13,259**
Deferred Income Taxes	**744**	**(19,496)**	**(9,107)**
Minority Interests in Earnings of Consolidated Subsidiaries	**14,203**	**10,836**	**5,499**
Net Income (Loss)	**24,724**	**(12,605)**	**(3,918)**

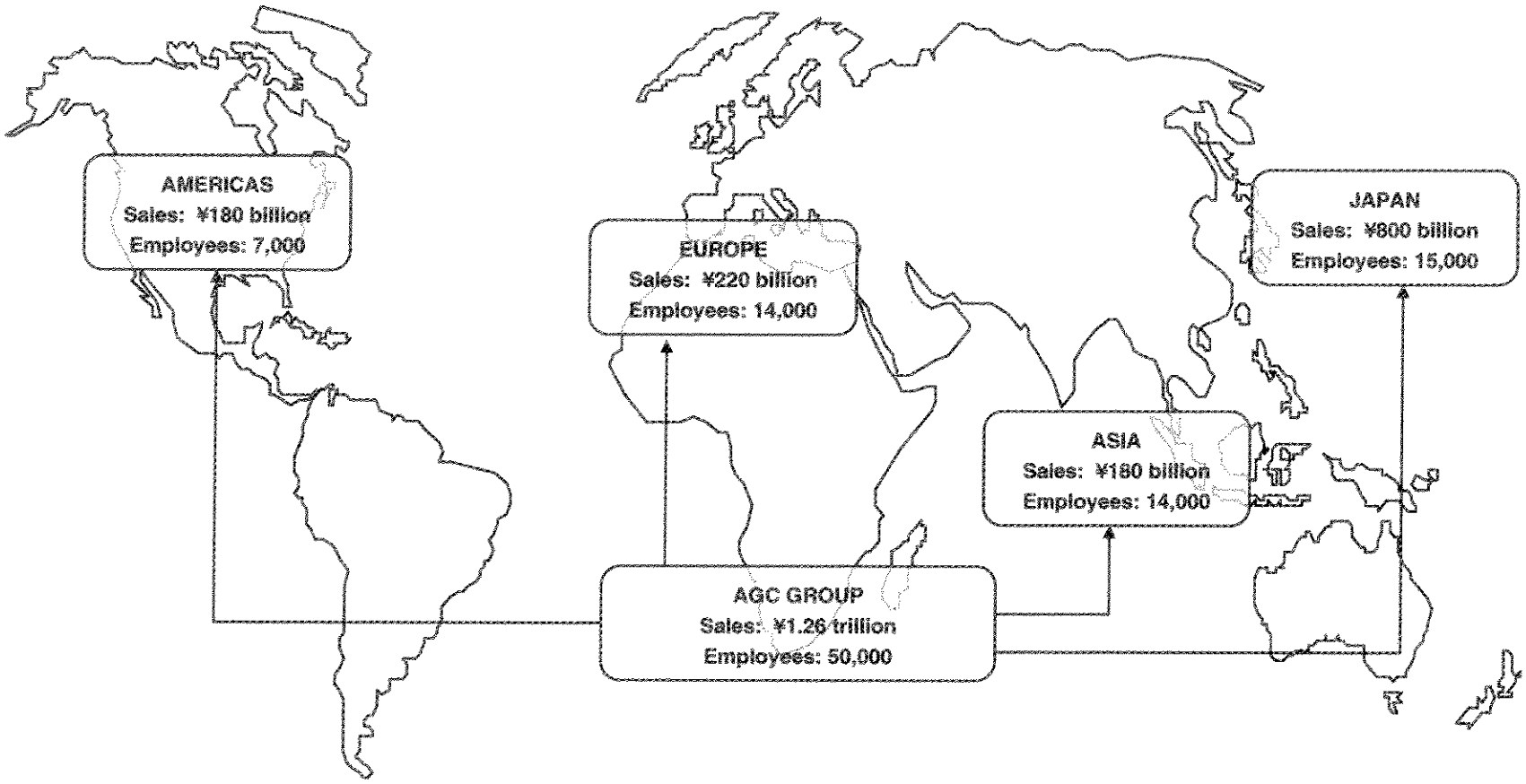
Exhibit 1 Financial Information (continued)

Consolidated Balance Sheets (in ¥ millions)

	For the Year Ended:		
	3/31/01	3/31/02	3/31/03
ASSETS			
Current Assets:			
Cash on hand and in banks	47,143	50,195	56,880
Trade notes and accounts receivable	26,721	241,803	241,232
Inventories	204,169	203,607	187,324
Other current assets	67,424	60,284	63,817
Total Current Assets	582,458	555,890	549,255
Fixed Assets:			
Tangible fixed assets:			
Building and structures	202,244	215,198	217,202
Machinery, equipment, tools and fixtures	423,554	447,059	432,879
Land	99,813	108,044	109,462
Construction in progress	37,171	47,695	39,322
Total tangible fixed assets	762,784	817,998	798,867
Intangible fixed assets	107,956	104,506	111,758
Investments, etc.:			
Investments in marketable securities	382,024	343,876	241,002
Other investments	50,900	66,500	85,101
Total investments, etc.	432,926	410,378	326,104
Total Fixed Assets	1,303,667	1,332,883	1,236,730
Deferred Assets	689	610	527
TOTAL ASSETS	**1,886,815**	**1,889,384**	**1,786,513**
Current Liabilities			
Trade notes and accounts payable	190,068	155,247	161,495
Short-term bank loans	148,006	159,254	109,087
Commercial paper	80,563	95,638	58,845
Current maturities of bonds	43,178	22,103	77,266
Nontrade payables	64,705	60,715	60,058
Other current liabilities	107,104	95,708	103,119
Total Current Liabilities	633,629	588,670	569,874
Long-term Liabilities			
Bonds issued	282,999	320,331	295,496
Long-term bank loans	130,101	137,987	144,987
Long-term deferred tax liabilities	60,991	43,692	33,989
Accrued retirement benefits	42,877	46,236	57,025
Other long-term liabilities	37,267	72,648	59,303
Total Long-term Liabilities	554,237	620,895	590,803
Minority Interest	91,948	93,842	71,999
Shareholders' Equity			
Common shares	90,472	90,472	90,472
Additional paid-in capital	84,388	84,395	84,395
Retained earnings	441,906	419,644	404,817
Assets revaluation reserve	119	117	117
Revaluation of investment in securities	50,969	20,090	8,912
Adjustments on foreign currency translation	(60,851)	(28,438)	(33,752)
Treasury shares	(3)	(306)	(1,127)
Total Shareholders' Equity	607,000	585,975	553,835
TOTAL LIABILITIES, MINORITY INTEREST & SHAREHOLDERS' EQUITY	**1,886,815**	**1,889,384**	**1,786,513**

Source: Company documents.

Exhibit 2 Global Presence



Source: Company documents.

Exhibit 3 History

Year	Progress and Development
1907	Asahi Glass Company established in Amagasaki, Hyogo Prefecture.
1909	Belgian-type hand-blown sheet glass manufacture begins (the first such production in Japan).
1914	The first shipment of sheet glass exported to England.
1917	Headquarters moved to Tokyo.
1956	The Indo-Asahi Glass Co., Ltd. established. Production of glass bulbs for TV picture tubes begins.
1963	Thai-Asahi Glass Public Co., Ltd. established.
1966	Asahi Glass and the U.S. firm PPG set up Asahi Penn Chemical Co., Ltd.
1972	P.T. Asahimas Flat Glass Co., Ltd. set up in Indonesia.
1979	Asahi Glass invests in MCIS Safety Glass Sdn. Bhd. in Malaysia.
1981	Asahi Glass acquired Glaverbel S.A. and MaasGlas B.V., glass companies in Belgium and the Netherlands.
1985	AP Technoglass Co. established in the U.S.A. Asahi TechnoVision Pte. Ltd. established in Singapore.
1989	Siam Asahi Technoglass Co., Ltd. established in Thailand.
1992	Dalian Float Glass Co., Ltd. established in China. Acquired AFG Industries, Inc. of the U.S.A.
1996	P.T. Video Display Glass Indonesia established.
1999	Acquired PTFE business in U.S. and U.K. of ICI. Acquired the majority interest of Hankuk Electric Glass, Co., Ltd. of Korea
2000	Asahi Glass Fine Techno Taiwan Co., Ltd. was established.
2001	Announced a public tender offer for shares in Glaverbel S.A.
2002	Creation of AGC Group Vision, "Look Beyond." Introduced an in-house company system.

Source: Company documents.

Exhibit 4 Segment Information

Business Segment Information

	For the Year Ended:		
	3/31/01	3/31/02	3/31/03
(in ¥ millions)			
Glass			
Sales	625,240	666,470	708,439
Operating profit	35,852	40,267	37,776
Assets	845,007	845,704	835,397
Depreciation	47,755	56,977	53,462
Capital expenditures	40,391	58,282	53,261
Electronics and Displays			
Sales	386,174	314,947	309,884
Operating profit	65,587	23,838	27,559
Assets	344,401	369,458	405,997
Depreciation	28,959	30,545	32,761
Capital expenditures	34,828	45,719	26,665
Chemicals			
Sales	274,965	258,676	261,330
Operating profit	9,011	(5,390)	1,389
Assets	302,838	315,983	292,901
Depreciation	18,789	20,726	21,471
Capital expenditures	15,569	23,342	17,647
Other			
Sales	93,805	88,224	69,487
Operating profit	1,124	391	766
Assets	250,254	240,796	255,605
Depreciation	2,091	1,765	1,356
Capital expenditures	2,533	3,703	709
(in ¥ millions)			
Total Sales	**1,380,186**	**1,328,318**	**1,349,142**
Corporate or eliminations	(67,357)	(65,122)	(54,131)
Consolidated sales	1,312,829	1,263,196	1,295,011
Total Operating Profit	**111,575**	**59,107**	**67,492**
Corporate or eliminations	76	(119)	(17)
Consolidated operating profit	111,652	58,988	67,475
(in ¥ billions)			
Glass			
Flat glass		382	426
Automotive glass		219	242
Other		91	83
Eliminations		(26)	(42)
Total		666	708
Electronics and Display			
Display	242	196	200
Electronic materials	148	123	116
Eliminations	(4)	(4)	(5)
	386	315	310

Exhibit 4 (continued)

Regional Segment Information (in ¥ millions)

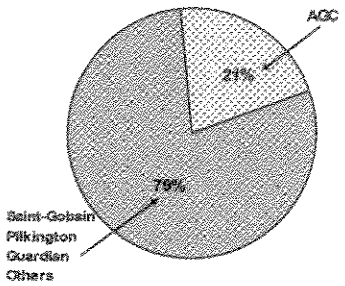
	For the Years Ended:		
	3/31/01	3/31/02	3/31/03
Japan			
Sales	841,008	765,710	775,841
Operating profit	39,389	7,118	15,182
Assets	950,994	909,322	800,254
Asia			
Sales	214,493	190,746	217,124
Operating profit	46,627	24,728	26,637
Assets	191,066	207,789	277,194
The Americas			
Sales	171,359	180,306	183,337
Operating profit	7,781	3,226	6,280
Assets	254,543	245,824	213,998
Europe			
Sales	190,365	224,201	258,491
Operating profit	18,115	24,030	19,439
Assets	190,382	232,451	317,290
Overseas Sales			
Sales	576,217	595,253	658,952
Operating profit	72,523	51,983	52,356
Assets	635,991	686,064	808,482
Total Sales	1,417,227	1,360,965	1,434,795
Corporate or eliminations	(104,398)	(97,768)	(139,783)
Consolidated sales	1,312,829	1,263,196	1,295,011
Operating Profit	111,914	59,103	67,540
Corporate or eliminations	(261)	(115)	(64)
Consolidated operating profit	111,652	58,988	67,475
Exchange Rates (¥/Foreign Currency)			
U.S. dollar:			
At year-end	114.75	131.95	119.90
Average	108.42	122.21	124.83
Euro:			
At year-end	106.55	116.51	125.08
Average	99.60	109.04	118.29

Source: Company documents.

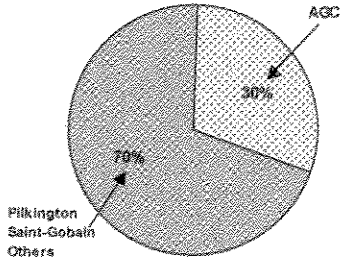
Exhibit 5 Global Market Shares

Market Share of Glass Products

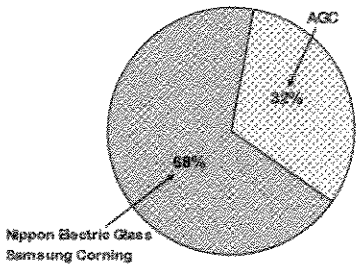
Flat Glass



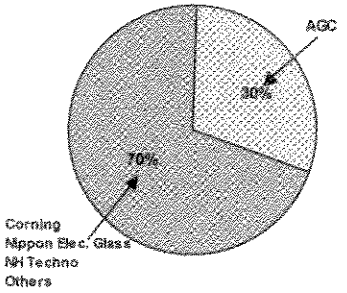
Automotive Glass



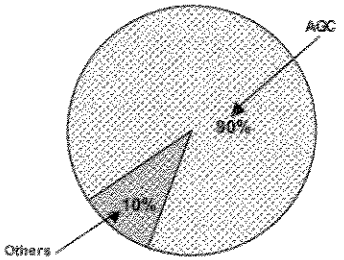
CRT Glass Bulb



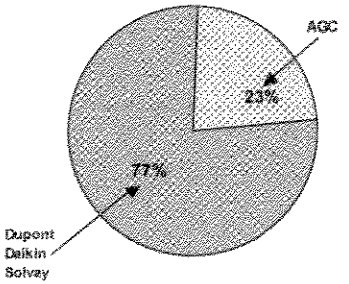
Thin Film Transistor Glass Substrates



Plasma Display Panel Glass Substrates



Fluorinated Resins (PTFE)



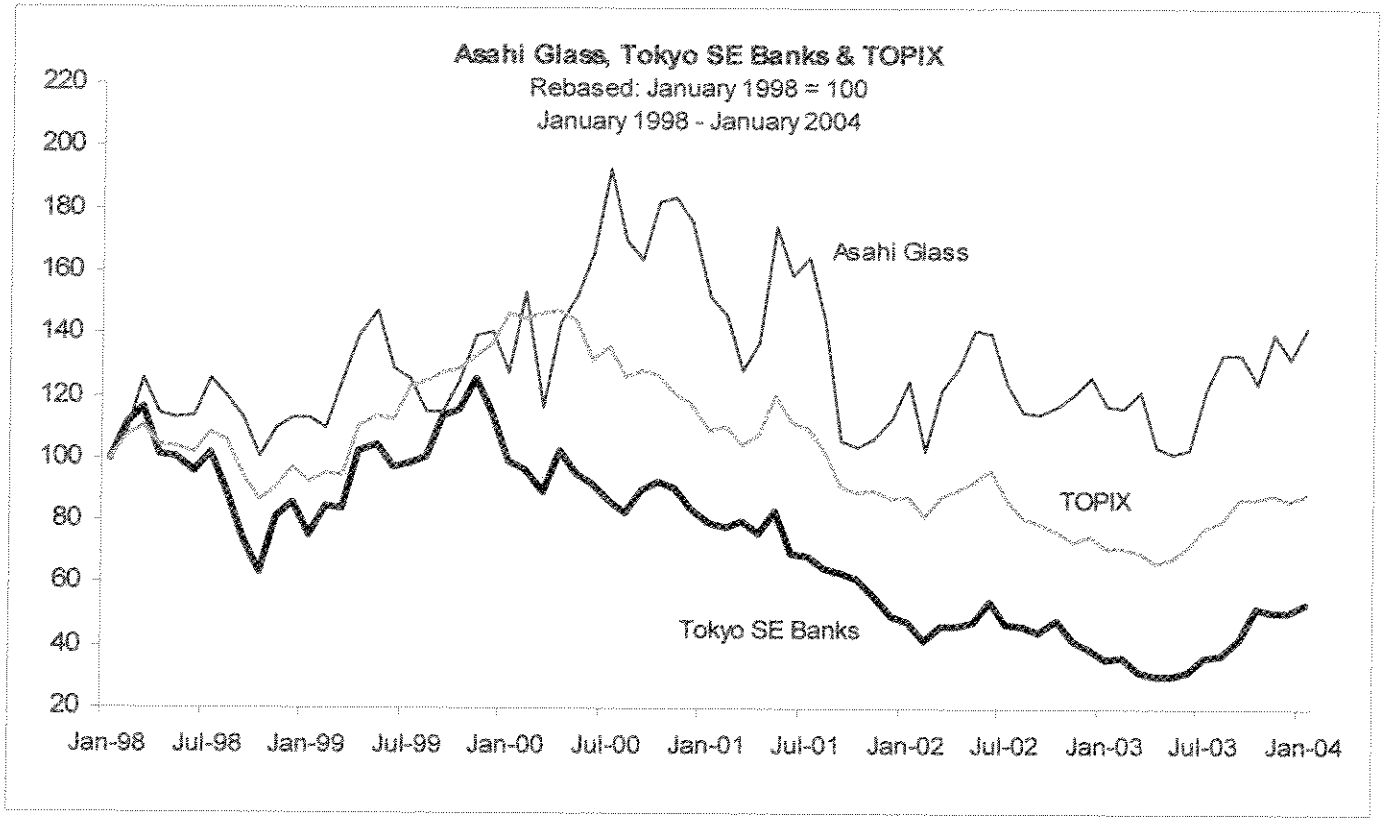
Source: Company documents.

Global Market Share of Flat Glass (2001)

	Europe	North America	South America	Japan	Asia	TOTAL
Asahi Glass	**25**	**19**	**0**	**40**	**18**	**21**
Saint-Gobain	27	2	36	0	13	16
Pilkington	22	14	36	0	4	15
Guardian	11	18	28	0	13	14
PPG	0	23	0	0	0	6
Nippon Sheet Glass	0	0	0	33	8	4
Central Glass	0	0	0	27	0	1
Others	15	24	0	0	44	23
Total	100	100	100	100	100	100

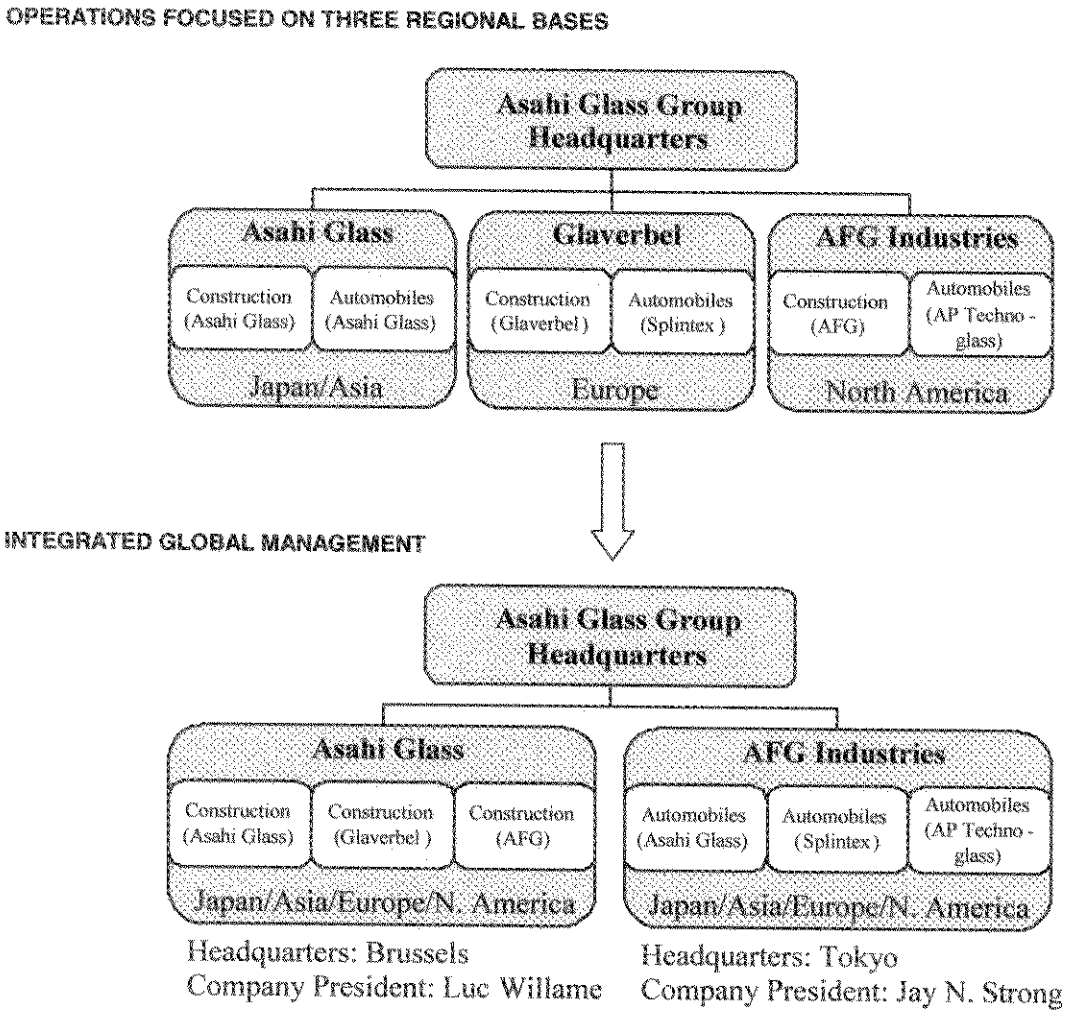
Source: UBS Warburg: Asahi Glass (March 19, 2003).

Exhibit 6 Stock Price Performance of AGC and Banks



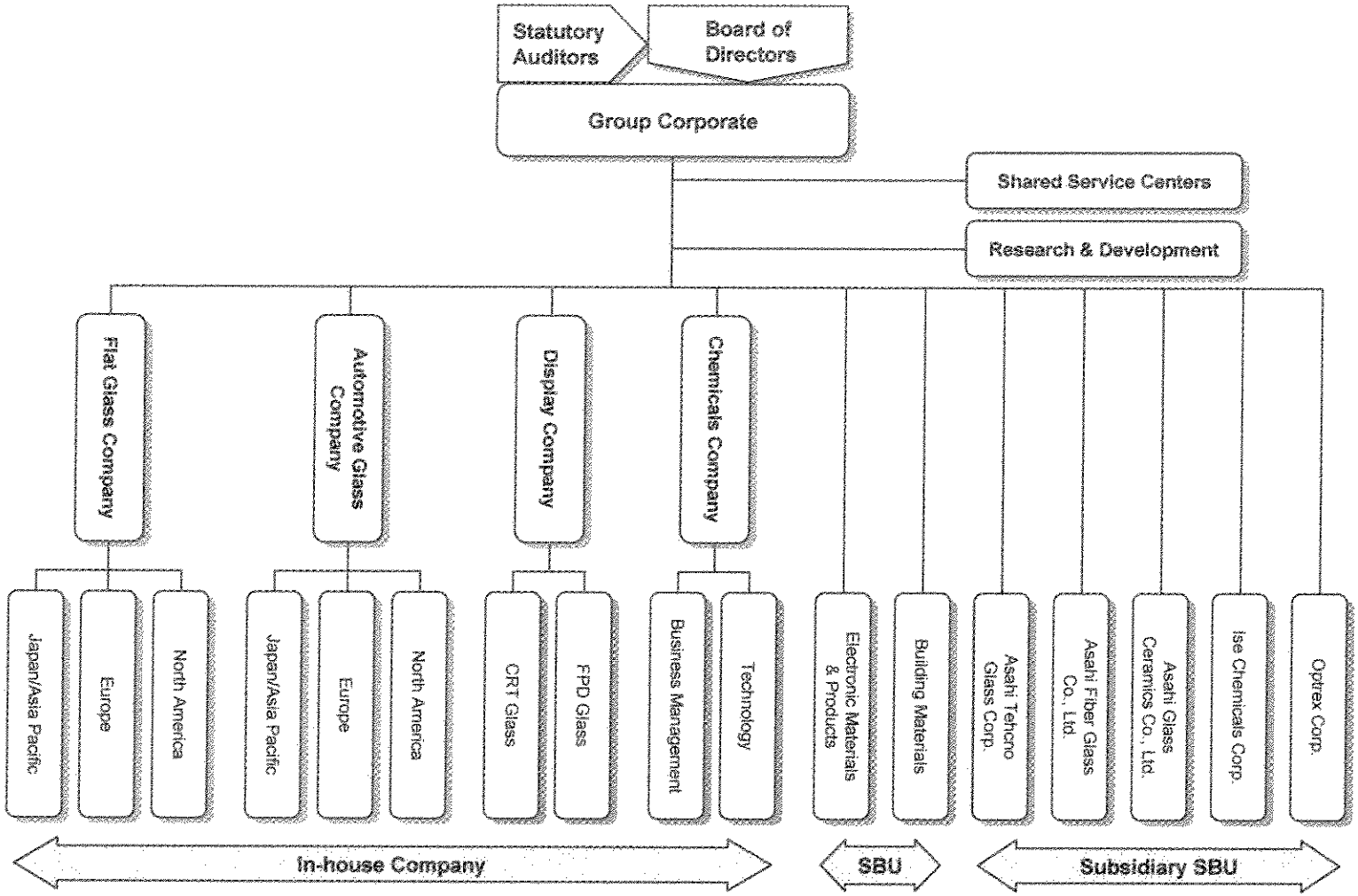
Source: Thomson Datastream.

Exhibit 7a Global Management Structure for Glass Business



Source: Company documents.

Exhibit 7b Establishment of Four In-house Companies



Source: Company documents.

Exhibit 8 WACC Calculation for Each Country

Local Currency	Risk-Free Rate (long-term)	Risk-Free Rate (short-term)	Spread (bps)	Debt Cost Before Tax	Tax Rate	Debt Cost After Tax	Market Risk Premium [a]	Cost of Equity	D/E Ratio	Debt Portion	Equity Portion	WACC	Rounded
Australia	5.46%	--	100	6.46%	30.00%	4.52%	3.50%	8.96%	0.70	1.86%	5.27%	7.13%	7%
Austria	4.35%	--	100	5.35%	34.00%	3.53%	2.50%	6.85%	0.70	1.45%	4.03%	5.48%	6%
Belgium	4.38%	--	100	5.38%	40.17%	3.22%	7.10%	11.48%	0.70	1.33%	6.75%	8.08%	8%
Canada	5.13%	--	100	6.13%	38.62%	3.76%	3.20%	8.33%	0.70	1.55%	4.90%	6.45%	6%
Denmark	4.40%	--	100	5.40%	30.00%	3.78%	9.80%	14.20%	0.70	1.56%	8.35%	9.91%	10%
France	4.31%	--	100	5.31%	34.33%	3.49%	6.90%	11.21%	0.70	1.44%	6.59%	8.03%	8%
Germany	4.29%	--	100	5.29%	38.90%	3.23%	4.70%	8.99%	0.70	1.33%	5.29%	6.62%	7%
Ireland	4.32%	--	100	5.32%	16.00%	4.47%	8.40%	12.72%	0.70	1.84%	7.48%	9.32%	9%
Italy	4.45%	--	100	5.45%	36.00%	3.49%	3.90%	8.35%	0.70	1.44%	4.91%	6.35%	6%
Japan	0.84%	--	100	1.84%	42.05%	1.07%	5.40%	6.24%	0.70	0.44%	3.67%	4.11%	4%
Netherlands	4.31%	--	100	5.31%	34.50%	3.48%	7.70%	12.01%	0.70	1.43%	7.06%	8.50%	8%
Singapore	2.60%	0.7%	100	3.60%	22.00%	2.81%	5.40%	6.10%	0.70	1.16%	3.59%	4.74%	5%
Spain	4.37%	2.6%	100	5.37%	35.26%	3.48%	5.40%	7.96%	0.70	1.43%	4.68%	6.11%	6%
Sweden	4.80%	3.6%	100	5.80%	28.00%	4.18%	12.20%	15.84%	0.70	1.72%	9.32%	11.04%	11%
United Kingdom	4.54%	--	100	5.54%	30.00%	3.88%	7.10%	11.64%	0.70	1.60%	6.85%	8.44%	8%
United States	4.18%	--	100	5.18%	39.50%	3.13%	5.30%	9.48%	0.70	1.29%	5.58%	6.87%	7%

[a]Based on short-term, risk-free rate if available.

US$	10 Year T Bond	Risk Premium	Spread	Debt Cost Before Tax	Tax Rate	Debt Cost After Tax	Equity Cost			D/E Ratio	Debt Portion	Equity Portion	WACC	Rounded
							Ibbotson	JP Morgan	Average					
China	4.18%	74	100	5.92%	33.0%	3.97%	17.4%	12.0%	14.69%	0.70	1.63%	8.64%	10.27%	10%
India	4.18%	280	100	7.98%	36.8%	5.05%	19.9%	12.6%	16.24%	0.70	2.08%	9.55%	11.63%	12%
Indonesia	4.18%	600	100	11.18%	30.0%	7.83%	28.9%	15.9%	22.39%	0.70	3.22%	13.17%	16.39%	16%
Korea	4.18%	140	100	6.58%	29.7%	4.63%	16.2%	14.7%	15.43%	0.70	1.90%	9.07%	10.98%	11%
Malaysia	4.18%	182	100	7.00%	28.0%	5.04%	18.0%	11.6%	14.79%	0.70	2.08%	8.70%	10.78%	11%
Pakistan	4.18%	850	100	13.68%	33.0%	9.17%	30.5%	20.7%	25.59%	0.70	3.77%	15.05%	18.83%	19%
Philippines	4.18%	541	100	10.59%	32.0%	7.20%	21.5%	15.2%	18.34%	0.70	2.97%	10.79%	13.75%	14%
Taiwan	4.18%	115	100	6.33%	25.0%	4.75%	13.8%	14.9%	14.37%	0.70	1.95%	8.45%	10.40%	10%
Thailand	4.18%	158	100	6.76%	30.0%	4.73%	19.8%	14.1%	16.94%	0.70	1.95%	9.97%	11.91%	12%
Vietnam	4.18%	650	100	11.68%	32.0%	7.94%	25.7%	18.7%	22.20%	0.70	3.27%	13.06%	16.33%	16%
Brazil	4.18%	1,356	100	18.74%	34.0%	12.37%	22.1%	23.4%	22.74%	0.70	5.09%	13.38%	18.47%	18%
Mexico	4.18%	305	100	8.23%	35.0%	5.35%	17.5%	12.9%	15.17%	0.70	2.20%	8.92%	11.13%	11%
Czech	4.18%	67	100	5.85%	31.0%	4.04%	16.5%	10.7%	13.58%	0.70	1.66%	7.99%	9.65%	10%
Russia	4.18%	350	100	8.68%	24.0%	6.60%	24.7%	13.7%	19.19%	0.70	2.72%	11.29%	14.00%	14%

Source: Company documents.

Exhibit 9a WACC Calculation for a Business Unit – Asian Flat Glass Business

Country	Cost of Capital	Capital Employed	CE * CoC	WACC Contribution
Japan	7.0%	626.2	43.8	3.8%
United States	7.0%	--	--	--
United Kingdom	7.0%	--	--	--
Euro	7.0%	--	--	--
Australia	7.0%	--	--	--
Singapore	7.0%	--	--	--
China	13.0%	59.9	7.8	0.7%
India	13.0%	--	--	-
Indonesia	15.0%	120.2	18.0	1.5%
Korea	10.0%	--	--	--
Malaysia	13.0%	--	--	--
Pakistan	21.0%	--	--	--
Philippines	13.0%	101.7	13.2	1.1%
Taiwan	10.0%	--	--	--
Thailand	13.0%	258.2	33.6	2.9%
Vietnam	15.0%	--	--	--
Total		**1,166.2**	**116.4**	**10.0%**

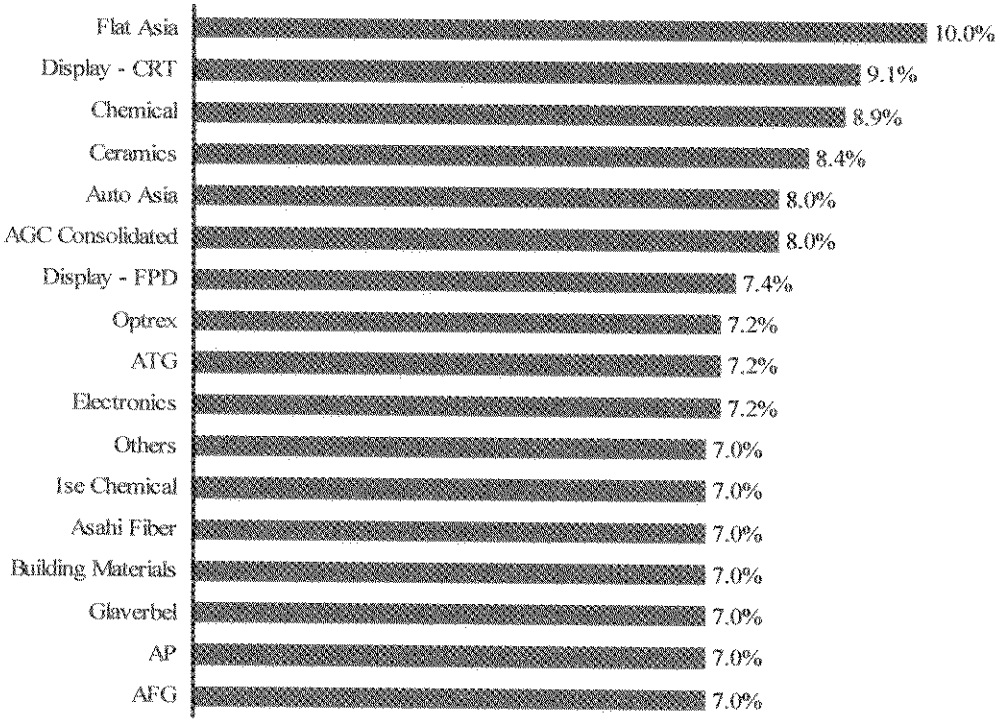
Source: Company documents.

Exhibit 9b WACC Calculation for a Business Unit – Flat Panel Display Business

Country	Cost of Capital	Capital Employed	CE * CoC	WACC Contribution
Japan	7.0%	776.0	54.3	6.2%
United States	7.0%	--	--	--
United Kingdom	7.0%	--	--	--
Euro	7.0%	--	--	--
Australia	7.0%	--	--	--
Singapore	7.0%	--	--	--
China	13.0%	--	--	--
India	13.0%	--	--	-
Indonesia	15.0%	--	--	--
Korea	10.0%	--	--	--
Malaysia	13.0%	--	--	--
Pakistan	21.0%	--	--	--
Philippines	13.0%	--	--	--
Taiwan	10.0%	105.7	10.6	1.2%
Thailand	13.0%	--	--	--
Vietnam	15.0%	--	--	--
Total		**881.7**	**64.9**	**7.2%**

Source: Company documents.

Exhibit 9c WACC by Division



Source: Company documents.

Exhibit 10a WACC and Tax Rate by Country
(for valuation)

Country	WACC	Tax Rate
Japan	7.0%	42.0%
United States	7.0%	40.0%
United Kingdom	7.0%	30.0%
Euro	7.0%	35.0%
Australia	7.0%	30.0%
Singapore	7.0%	22.0%
China	13.0%	33.0%
India	13.0%	36.8%
Indonesia	15.0%	30.0%
Korea	10.0%	29.7%
Malaysia	13.0%	28.0%
Philippines	13.0%	32.0%
Taiwan	10.0%	25.0%
Thailand	13.0%	30.0%
Brazil	13.0%	34.0%
Mexico	13.0%	35.0%
Czech	10.0%	31.0%
Russia	15.0%	24.0%

Source: Company documents.

Exhibit 10b WACC and Tax Rate by Division
(for performance evaluation)

Division	WACC	Tax Rate
AGC Group	8.0%	38.0%
Flat Glass Co.	8.0%	37.0%
Flat Glass, Asia	10.0%	37.0%
Flat Glass, America	7.0%	40.0%
Flat Glass, Europe	7.0%	35.0%
Automotive Co.	8.0%	39.0%
Automotive, Asia	8.0%	40.0%
Automotive, America	7.0%	40.0%
Automotive, Europe	7.0%	35.0%
Display Co	8.0%	36.0%
Display, CRT	9.0%	34.0%
Display, FPD	7.0%	40.0%
Chemical	9.0%	39.0%
Electronic	7.0%	41.0%
Building Material	7.0%	42.0%
Ceramics	8.0%	40.0%
Asahi Fiber	7.0%	42.0%
ATG	7.0%	42.0%
Ise Chemical	7.0%	42.0%

Source: Company documents.

Exhibit 11 Analysis of Competitors (in ¥ billions)

	Shin-etsu (A)	Bridgestone (B)	Pilkington (C)	Saint-Gobain (D)	DuPont (E)	PPG (F)	Avg. (A-F)	Avg. (C,D,F)
Interest-bearing debt	178	766	242	1,093	894	314		
Short-term	114	331	123	483	192	91		
Long-term	64	435	119	610	702	223		
Shareholders' equity	812	835	134	1,385	1,895	404		
Market value	2,284	1,195	255	1,655	6,071	1,179		
Interest expense	6	27	12	70	77	22		
Interest rate before tax	3.4%	3.5%	5.0%	6.4%	8.6%	7.0%		
Tax rate	42%	42%	30%	36%	41%	41%	39%	36%
Interest rate after tax	2.0%	2.0%	3.5%	4.1%	5.1%	4.1%		
Risk-free rate	1.4%	1.4%	4.9%	5.0%	5.0%	5.0%		
Beta	1.07	0.91	0.83	0.84	0.86	0.83		
Market risk premium	6.2%	6.2%	7.9%	7.8%	6.0%	6.0%		
Required return on equity	8.0%	7.0%	11.5%	11.6%	10.2%	10.0%		
Beta, Unlevered	1.02	0.66	0.50	0.59	0.79	0.72	0.71	0.60
Beta, Levered w/ D/E 0.7	1.44	0.93	0.74	0.85	1.12	1.01	1.02	0.87
D/E, book value basis	0.22	0.92	1.81	0.79	0.47	0.78	0.83	1.12
D/E, market value basis	0.08	0.64	0.95	0.66	0.15	0.27	0.46	0.62
WACC, book value basis	6.9%	4.7%	6.3%	8.3%	8.5%	7.4%		
WACC, market value basis	7.6%	5.1%	7.6%	8.6%	9.5%	8.8%		
Total assets	1,289	2,444	535	3,734	5,287	1,108		
Enterprise value	2,462	1,961	497	2,748	6,965	1,493		

Source: Company documents.