Dipartimento di Economics and Business

The capital structure decision and the management of financial liabilities: evidence from STMicroelectronics

Relatore:

Prof. Federico Calogero Nucera

Candidato:
Federico Notarnicola
Matr. 182371

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1. Introduction

The capital structure policy of a company addresses the right part of the balance sheet focusing on the financing alternatives a corporate may have access to in terms of equity and debt securities.

Indeed a company may decide among many different capital structure alternatives, leveraging its balance sheet with a significant amount of financial debt rather than opting for a very conservative net cash position or modest leverage. A company can issue fixed income bonds in the debt capital markets or borrow from the banking sector at floating rate, either on bilateral basis or through syndicates. Furthermore a company may opt for some form of off balance sheet financing such as operating leases as an alternative to issuing bonds or drawing from banking facilities.

The right capital structure is a very important decision for a corporate. There are both costs and advantages for a company in being overleveraged rather than underleveraged and the management has to achieve the optimal capital structure consistent with their investments and business strategy. It is however important to maintain some additional debt issuance capability even when trying to maximize the company's value. Whereas a higher leverage can produce positive effects in terms of tax optimization, it also exposes to potential financial distress because of lack of financial flexibility like in some cases of very aggressive Leverage Buy Out from Private Equity Funds when adverse business cycles or wrong business plans have impaired the company's capacity to repay its principal debt maturities and related interest coupons.

A company under financial stress may be negatively affected in its core business with clients and suppliers, also losing key employees and the management focus can be diverted from important business decisions since the short term priority becomes how to fund the next debt maturity redemption.

On the other end no leverage at all means that a company is giving up the use of cheaper sources of financing using entirely equity that is, by definition, the most expensive source of capital for any corporate.

The level of optimal leverage varies from industry to industry. Utilities and telecom companies with steady and predictable cash flows can significantly leverage their balance sheet whereas technological companies with high Research & Development costs and Capital Expenditures must be more prudent to avoid losing financial flexibility during

adverse business cycles. Financial flexibility can be defined as the combination of a modest financial leverage together with a good level of liquidity and available committed credit facilities which would allow a company to weather a negative business cycle without the urgency of refinancing expiring debt and also pursue acquisition opportunities having additional debt issuance capability.

The maturity profile of the financial liabilities is also very important. The longer the maturities, the more manageable and predictable will be the refinancing of expiring debt. It is also prudent to limit concentration of debt maturities to avoid being forced refinancing all the financial liabilities in a period of financial market turmoil such as, for instance, the one following the Chapter 11 filing of Lehman Brothers in September 2008.

The maximum sustainable leverage is a function of the company operating profit and its earnings before interest, taxes, depreciation and amortization (EBITDA).

Rating Agencies assign the external credit ratings to corporates active in the Debt Capital Market by assessing both their business and their financial profile, as it will be highlighted in the chapter of the Rating Agencies. The higher the leverage, the lower will be the Rating which will impact the profit and loss line of interest expenses. Only companies with high and steady operating profit can afford leveraging to multiples of Gross Debt/EBITDA ratio.

A trade-off between the very expensive cost of equity and excessive leverage could be the issuance of convertible bonds in the equity linked capital market. The sale of the embedded conversion option does allow achieving significant savings in terms of lower interest expenses versus traditional straight debt bonds or bank loans. However equity linked instruments are usually unfriendly to the existing shareholders who may be diluted in case of conversion. Moreover convertible bonds, according to the feature of conversion and the adopted GAAP of the company’s financials, may negatively affect the Earning per Share (EPS).

In the following chapters I will describe the capital structure and the financial policy of STMicroelectronics, a leading European player of the global semiconductor industry and its recurrent tapping of the equity linked capital markets as the most frequent way of financing.

1.1. The optimal capital structure

From an academic point of view Franco Modigliani and Merton Miller – M & M (1958) published their capital structure theory that made each of them won a Nobel Prize in Economics.

M & M state in their famous “proposition I” that the firm’s value is determined by its real assets and not by the securities it issues. Therefore the M&M’s “proposition I” allows complete separation of investment and financing decisions so that a company can plan its own capital expenditures without worrying about the sources of financing them.

According to M&M, in a perfect market any mix of securities is as good as another and the value of the company won’t be affected by its decision of capital structure.

M&M compare two companies, ***U*** and ***L,*** that generate the same stream of operating income but are different only in the capital structure. Company ***U*** is the one unlevered and the total value of its equity E_u is equal to the total value of the firm V_u. Company ***L*** is levered and the value of its stock is therefore equal to the value of the firm less the value of the debt as represented in the formula (1)

$$E_l = V_l - D_l \qquad (1)$$

According to M&M the pay-off of buying shares of the unlevered company ***U*** is exactly the same than buying the same number of shares of the levered company ***L*** together with the relevant fraction of debt. In a perfect world where investors could lend or borrow on their own account on the same terms of the company, they could mirror the effects of any changes in the firm’s capital structure.

M&M concede that leveraging the balance sheet increases the expected rate of return of shareholders’ investment but also make riskier buying the firm’s shares. M&M show that the risk increase exactly offsets the rise in expected return, leaving shareholders no better or worse off.

“Proposition I” depends however on the assumption of perfect functioning capital markets where even small investors could replicate at the same conditions the borrowing and investments choices of the company they are shareholders of.

M&M's opponents, the so called "traditionalists", argue that the capital structure does matter because of imperfections such as taxes, costs of entering into complex debt agreements and eventually the cost of bankruptcy .The traditionalists therefore argue against a total separation of investment and financing decisions which have to be taken consistently with the aim of an optimal capital structure for the company. Furthermore, according to M&M's opponents, Proposition I is an extremely general result that does apply not only to the debt-equity trade-off but to any choice of financing instruments. For example M&M do not differentiate between short and long term borrowing and they would say that the choice has no effect on firm value.

The key M&M "proposition I" that the value of a company is independent of the capital structure would have worked in a world without taxes. In the real world, in the vast majority of the countries where multinational companies issue debt instruments, they incur into interest expenses which will become tax deductible. Therefore we can say that financial leverage does increase the company's value because of the tax shield (interest on debt is tax deductible).

Companies may decide to change their capital structure because investments programs or Merger and Acquisition opportunities. Especially in an M&A contest they have to decide on how to finance the acquisition of the target and the impact of the mix of funding sources on their capital structure. But a change in the capital structure can happen even without an M&A trigger through a debt- financed share buy-back program which increases the debt and reduces the equity, therefore generating higher tax shield and company value.

Another advantage of debt is about the discipline it enforces upon the company and its managers that will have to meet the periodic debt obligations as interest expenses and principal repayments therefore monitoring closely the operating expenses. Whenever private equity funds take control of a company through a leverage buy out, the discipline of expenses control increases dramatically.

Jensen (1986) introduced the "free cash flow hypothesis" which states that when a company has excess cash relative to all the available projects with Net Present Value (NPV)>0, its managers will be inclined to use the cash in negative NPV projects.

Therefore financial leverage can stimulate the managers to optimize the company's resources managing more efficiently the operating expenses. The benefits associated with

financial debt have triggered the majority of leveraged buyouts (LBOs) made by the private equity players.

By leveraging the company's balance sheet the shareholders achieve to reduce their equity investment while at the same time creating strong incentives for the executives to better perform well and deliver on the debts scheduled payments.

However there are also many costs associated with high financial leverage.

Modigliani and Miller assumed a constant cost of debt. However debt investors will require an interest rate higher than the risk free rate.

The cost of debt as in formula (2) is given by

$$r_{debt} = r_f + spread \quad (2)$$

where r_{debt} is the corporate cost of debt and r_f is the risk free rate or the yield to maturity of similar maturity government bonds and the spread is the market estimate of a company credit risk.

1.2. Credit risk indicators: Ratings and CDS

Credit ratings are an important tool in helping capital market debt investors in their asset allocation strategy. A credit rating is an independent evaluation of the creditworthiness of an issuer or of a specific bond.

Bonds with a rating equal to or above Baa3 for Moody's and BBB- for Standard & Poors (S&P) and Fitch are considered investment grade whereas bonds with lower ratings are considered speculative grade or junk or high yields bonds.

Usually pension and investment funds have restricted policy and cannot hold and/or invest in securities below investment grade.

Rating agencies weigh many factors when determining a company's credit rating such as cash flow generation, product innovation and differentiation, geographical diversification and assets tangibility.

Moody's look at some key ratios when rating the non-financial companies. As shown in Table 1, these are the operating margin, the EBIT/Interest expense, the Debt/EBITDA and the debt/equity.

Table 1. Moody's Financial Metrics

	Operating margin (%)	EBIT/ Interest expense	Debt/EBITDA	Debt/Equity (%)
Aaa	20.3	21.6	1.0	24.7
Aa	13.1	9.6	1.7	35.4
A	11.2	6.9	2.2	43.5
Baa	10.9	4.2	2.9	47.0
Ba	11.1	3.0	3.3	51.1
B	8.0	1.4	5.1	72.3
C	2.7	0.4	7.6	98.1

Source: Moody's Financial Metrics Key Ratios for Global Non-Financial Corporations: December 2010.

The inverse correlation between debt increase and rating appears evident. Moreover, as the company's ability to pay the interest costs decreases (EBIT/Interest expense), its rating tends to decrease as well because creditors identify a higher risk of not being repaid.

Therefore lower ratings are associated with a higher cost of debt.

On the Table 2 below, it is represented the relation between the average spread required by investors for different investment-grade and speculative-grade bonds. The spread consists in the remuneration required to compensate all the risks that the investor will bear when subscribing or holding a certain debt security.

Table 2. Average spread for investors for every rating level

Investment grade	
AAA	0.21%
AA	0.34%
A+	0.48%
A	0.56%
A-	0.88%
BBB+	0.94%
BBB	1.13%
BBB-	1.70%

Junk bonds	
BB+	2.18%
BB	2.41%
BB-	2.64%
B+	3.14%
B	3.41%
B-	4.08%

Source: Bloomberg, January 2014.

The debt capital market access depends on the profitability and the internal cash flow generation of a given company. Therefore the external rating has a very important role in raising funds from the debt investors' community.

Companies with investment grade ratings have today very easy access to debt capital market and short term corporate borrowing whereas company which are significantly sub investment grade may struggle to issue high yields bonds during periods of adverse financial market conditions.

Another indicator of the credit risk of a company is the Credit Default Swap (CDS), which is a credit derivative contract to insure against the insolvency of the underlying bonds of a given company. The buyer of the CDS pays a premium to the seller who grants an insurance against the default of the issuer of the underlying bonds. The most liquid CDS are those of recurrent issuers on the fixed income debt capital market and they are priced on different maturities even though the most traded and liquid are the 3 and the 5 years CDS.

The cost of equity of a company does not only depend on its business profile but also on its leverage and therefore the financial risk for the shareholders. Therefore a higher leverage has negative effects both on the cost of debt and equity.

A very aggressive leverage that raises risks of insolvency for a company with a sound business profile may bring very negative consequences.

In case of bankruptcy there are not only the legal costs of the insolvency procedures but also the so called financial distress costs which are usually much more significant.

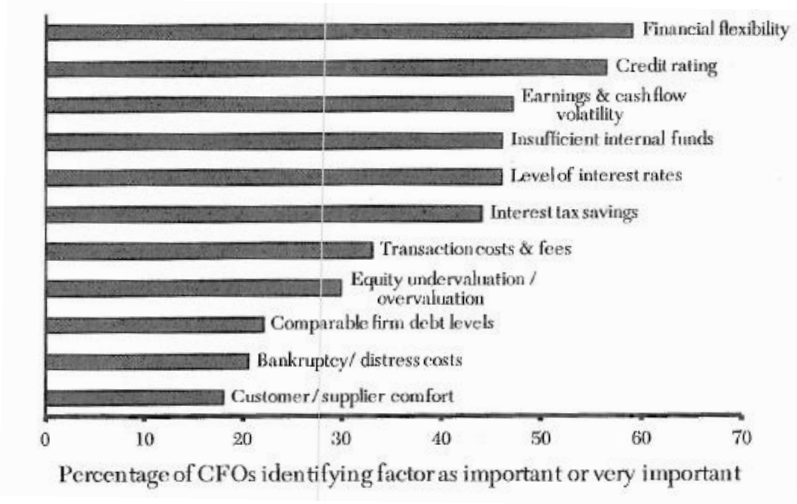
During or even in the period heading to financial distress the suppliers, the clients and the key employees may abandon the company because of lack of confidence in the near future obligations.

Retention becomes an issue with the most talented resources and the management gets its focus only on the short-term financial issues rather than on medium term developing strategies.

1.3. The concept of financial leverage

Financial leverage is a very important factor to weigh-in when deciding on the optimal capital structure. A too high leverage may prevent the company from taking investment or acquisition opportunities and consequently destroys value whereas a competitor with a more balanced capital structure and access to debt capital market and banks' credit facilities can pursue the same growth opportunities.

Table 3. Importance of different factors in deciding on company Debt levels



Source: Graham and Harvey (2001) and Finance for Executives (2014)

Financial flexibility, which can be defined as the capability to raise additional capital from the markets by companies with low level of debt, is relevant also to understand the different capital structures decisions across the different industries as the above survey among the CFOs of a selected sample of multinational corporates shows (see Table 3).

It is not easy to take the right decision on the optimal capital structure.

It has been highlighted before that the main advantage of debt on balance sheet is the interest tax shield it creates. On the other side excessive leverage will increase both the cost of debt and equity. Financial distress risk and lack of financial flexibility are also important ingredients to bear in mind to avoid overleveraging the company.

An optimal capital structure will be different according to the industry the company operates in.

A low financial leverage is definitely more important in high growth sectors and technology industries where strategic opportunities have to be taken quickly and for this reason the leading companies should not be overleveraged.

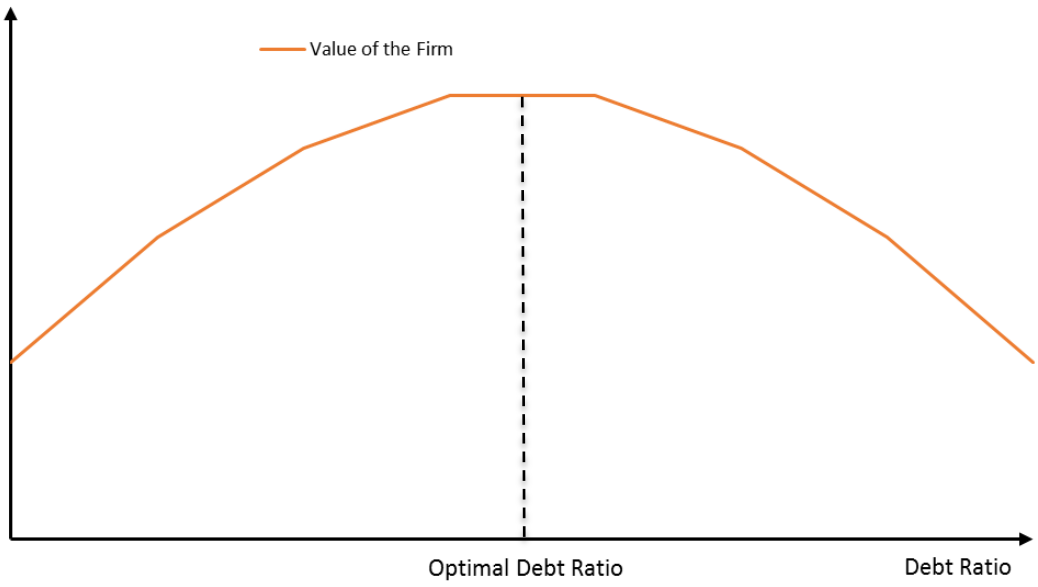
On the other sides companies that operate in jurisdictions with high tax rate should carry higher level of financial debts since the tax shield increase the value of the company. The direct relationship is shown in the right part of the below Chart 1.

The leverage has however to be reasonable because excessive debt reduce the financial flexibility of the company and increase the risk of default with a negative effect on the value of the company as highlighted on the left part of Chart 1.

To achieve an optimal capital structure the company should target a level of debt that targets the best balance between tax shield maximization in relation to the risk of default and loss of financial flexibility.

The Chart 1 therefore represents the combinations of the positive and negative consequences of leverage resulting in a debt to equity ratio combining these offsetting factors.

Chart 1. Combining all effects – Optimal capital structure



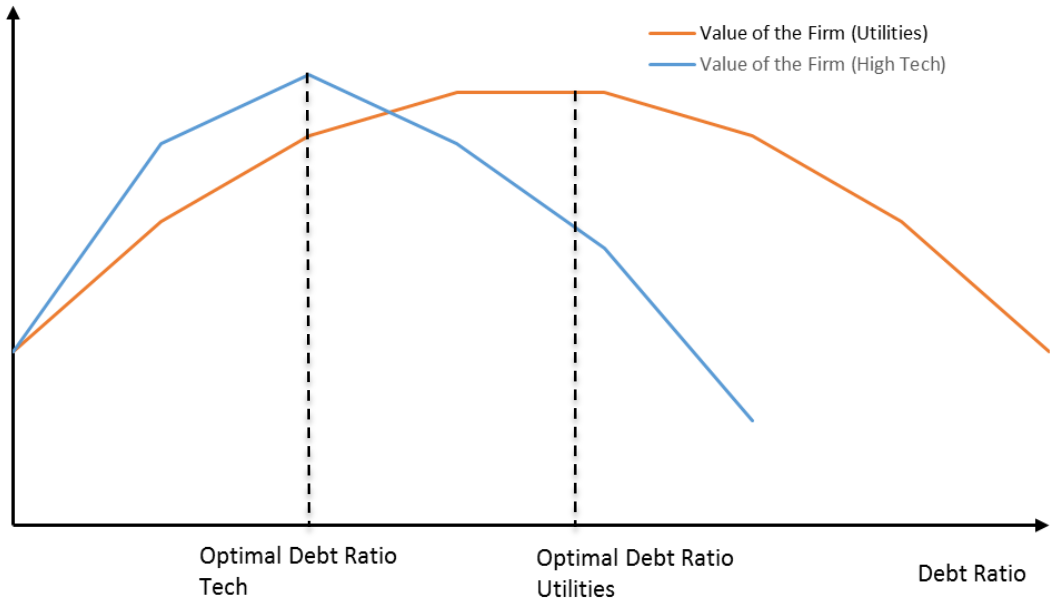
Source: Finance for Executives (2014)

This Chart shows that up to a certain level of leverage the positive effect of the improving tax shield is higher than the negative effects of the increasing risk of financial distress and financial flexibility loss. However when the absolute leverage becomes excessive the negative impact of higher default risk and loss of flexibility more than offsets the positive effect of the tax shield resulting in value destruction.

There is finally a debt to equity ratio that constitutes the optimal capital structure of the company. However the debt to equity ratio target for the optimal capital structure will be different according to the industry where the company is active.

Utilities operators experience a lower cost of financial distress whereas in the high tech industry the need of higher financial flexibility results in a lower debt to equity ratio (see Chart 2).

Chart 2. The Debt ratio depending on sector



Source: Finance for Executives (2014)

So the optimal capital structure is achieved with a debt ratio that maximizes the value of the company.

The weighted average cost of capital (WACC) is calculated according to the formula (3):

$$WACC = (1 - tax\ rate) * r\ debt * \frac{Debt}{Debt+Equity} + r\ equity * \frac{Equity}{Debt+Equity} \quad (3)$$

in the formula r debt is the cost of debt and r equity is the cost of equity

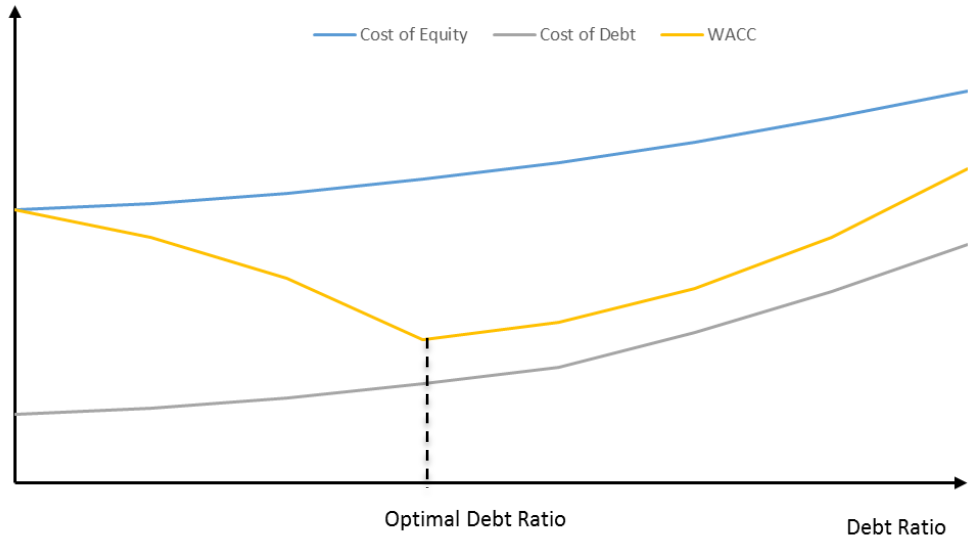
By nature debt investment is less risky than equity holding and therefore the cost of debt is lower given the subordination of shareholders versus bondholders of a company in financial distress and the discretionary payment of dividends versus the contractual interest payments to the debt holders.

The WACC is the cost of funding of a company after the tax payments to take into consideration the tax shield obtained through interest payments.

The WACC is calculated as the weighted average of the cost of equity and the cost of debt after tax based on the debt to equity ratio of the company.

The Chart 3 shows that the WACC can decrease through higher leverage only up to a certain level because of the accretive effect of the tax shield on the incremental debt. Beyond a certain level however both the cost of equity and debt start increasing because of the perceived higher risk of default. Therefore the optimal debt ratio that minimizes the WAAC equals to the optimal capital structure.

Chart 3. The WACC and the Optimal Debt Ratio



Source: Finance for Executives (2014)

1.4. Different approaches of financial assets and liabilities management

Likewise the liability management, the liquidity investments must have a very conservative risk profile since the cash and the tradable securities on the balance sheet of a company need to support its core business, its working capital and investment opportunities. So there must be a trade- off between the yield and the risk profile of the liquidity investment that needs to be as close as possible to risk free.

A conservative treasury policy should not allow investments in risky assets such as low rated investment grade bonds and structured products with credit enhancement that expose the company to potential principal losses. There are cases of Corporates that have heavily invested in Collateralized Debt Obligations (CDOs) and Credit Linked Notes (CLNs) whose underlying exposures have defaulted causing very significant principal losses together with a high degree of illiquidity of the financial assets on the balance sheet.

The most conservative Corporate Treasurers do invest the liquidity in Government Bills of Sovereign issuers with AAA or AA ratings, in reverse purchase agreements of Government Bonds with similar ratings, in Money Market Funds with AAA ratings and in short term deposits with commercial banks with at least single A ratings.

Indeed the most important factor for a corporate treasury is the immediate availability of the liquidity and the principal protection rather than the yield since the value creation for the shareholders of a no financial corporation comes from the Earnings before interest and taxes (EBIT) and not from the performances of the financial assets under management.

Finally a company with a net debt position must be hedged against the risk of future interest rise either issuing fixed income bonds or hedging its floating rate liabilities with off balance sheet instruments such as Interest rate swaps (IRS)-

Companies that try to minimize the interest expenses by having all the financial liabilities at floating rate may run into serious problems in case of sudden increase of interest rates that may impair their solvency.

I will highlight in the following chapter the capital structure and assets and liability management of STMicroelectronics.

2. About STMicroelectronics and its Capital Structure

In this chapter I will highlight the capital structure and the financial policy of STMicroelectronics (ST), a global semiconductor company with net revenues of $ 6.90 billion in 2015.

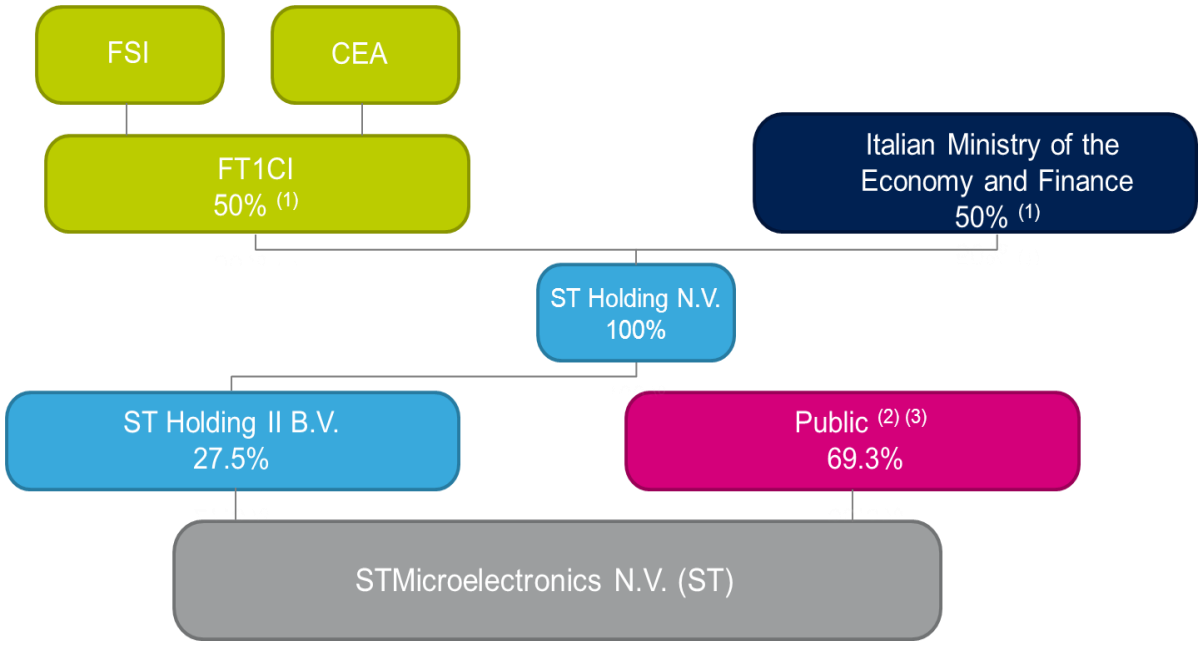
The company was created in 1987 through the merger of the Italian SGS Microelettronica and the French Thomson Semiconductors. It is incorporated under the corporate law of the Netherlands while its Headquarter is located in Geneva, Switzerland.

ST has become a public company in 1994 following the Initial Public Offering on the New York Stock Exchange (NYSE). ST is also listed on the Euronext Stock Exchange in Paris and on the Borsa Italiana of Milan with a current market capitalization above $ 10 billion.

ST is part of the FTSE MIB, as one of the 40 most important companies listed on the Italian Stock Exchange.

A significant percentage of ST shares are owned by the French and Italian Governments through the structure shown in Chart 4

Chart 4. ST Shareholding Structure



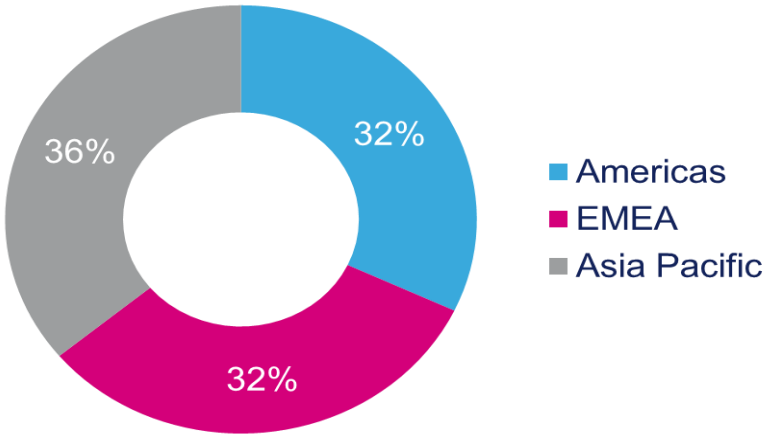
(1) Based on Corporate Governance rights pursuant to ST Holding Shareholders' Agreement.
(2) New York Stock Exchange, Euronext, Paris and Borsa Italiana, Milano
(3) In addition to the 27.5% held by ST Holding II B.V. and the 69.3% held by the Public, 3.2% are held by the Company as Treasury shares

Source STMicroelectronics website

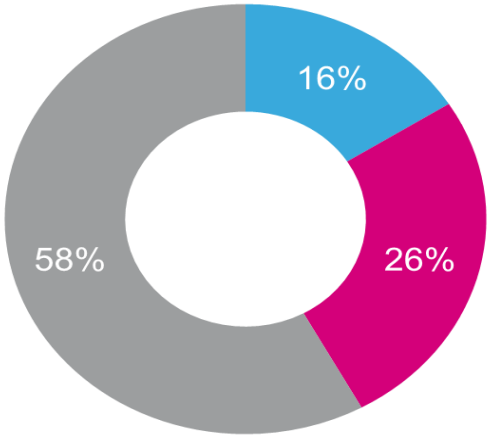
The below chart 5 represents the revenues of STMicroelectronics by region of origin at the end of Q3 2016 which is quite even among the 3 macro regions, the Americas, EMEA (Europe, Middle East and Africa) and the Asia Pacific where the company operates globally,

However in terms of shipping nearly 60% of revenues are concentrated in Asia where ST has the larger Back End facilities where the chips are finally tested, packaged and shipped to its customers and distributors. Furthermore many important US clients, such as Apple and Hewlett Packard do have manufacturing operations mainly in China where they ask their semiconductor supplier to ship the components.

Chart 5. ST revenues by region of origin as of Q3 2016(%) and



by location of shipment as of Q3 2016 (%)



Source: STMicroelectronics website

2.1. Products Portfolio

ST competes globally with US semiconductor companies such as Texas Instruments, Analog Devices and Maxim, European players such as NXP and Infineon and the Japanese Renesas,

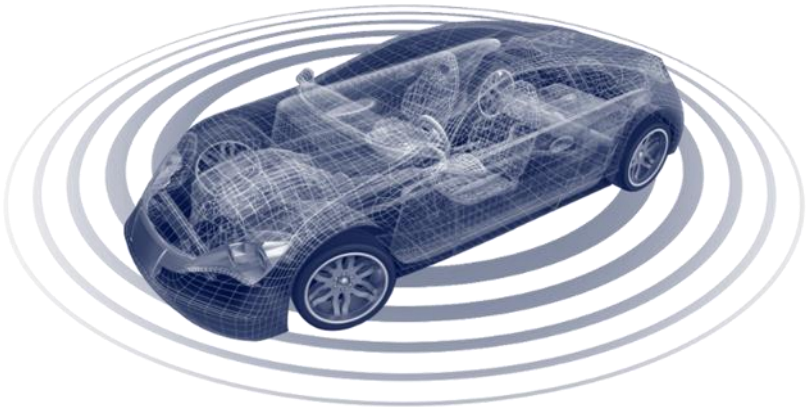
ST is one of the leading semiconductor companies in the Specific Available Market (SAM) of applications for the smart driving and the Internet of things. The total estimated SAM for 2016 is about $ 130 billion while the Total Available Market, which is made of all the semiconductors applications (including computers and memories which are not manufactured by ST) is worth about $ 320 billion of sales in 2016.

The Company offers one of the industry broadest product portfolios, serving customers across the spectrum of electronics applications with innovative semiconductor solutions for Smart Driving and the Internet of Things.
ST's products can be found everywhere, enabling smarter driving and smarter factories, cities and homes, along with next generation of mobile and Internet of Things devices.

Smart Driving - It is estimated that 80% of innovations in the automotive industry today are directly or indirectly enabled by electronics, which means a constant increase in the semiconductor content per car every year.
ST's Smart Driving products and solutions make driving safer, greener and more connected through the fusion of several technologies.
Driving safer thanks to Advanced Driver Assistance Systems (ADAS) products – vision, radar, imaging, sensors and GNSS positioning technologies, as well as to Adaptive Lighting Systems and User Driving greener with energy-management processors (EMU,ECU), Power Electronics at the heart of all automotive subsystems, Wide Band-Gap technologies (SiC and Gan) for electric cars, sensors and more.
Vehicles are more connected using car-to-car and car-to-infrastructure (V2X) connectivity solutions, infotainment system and telematics processors, Tuners, Amplifiers and Sensors.

The Chart 6 shows some of the key applications of ST Automotive Group which is focused on developing chip solutions to enhance safety and connectivity on the left hand side and power savings devices to reduce emissions and contribute to the diffusion of hybrid and electric vehicles.

Chart 6. Smart Driving contents



Source: STMicroelectronics website

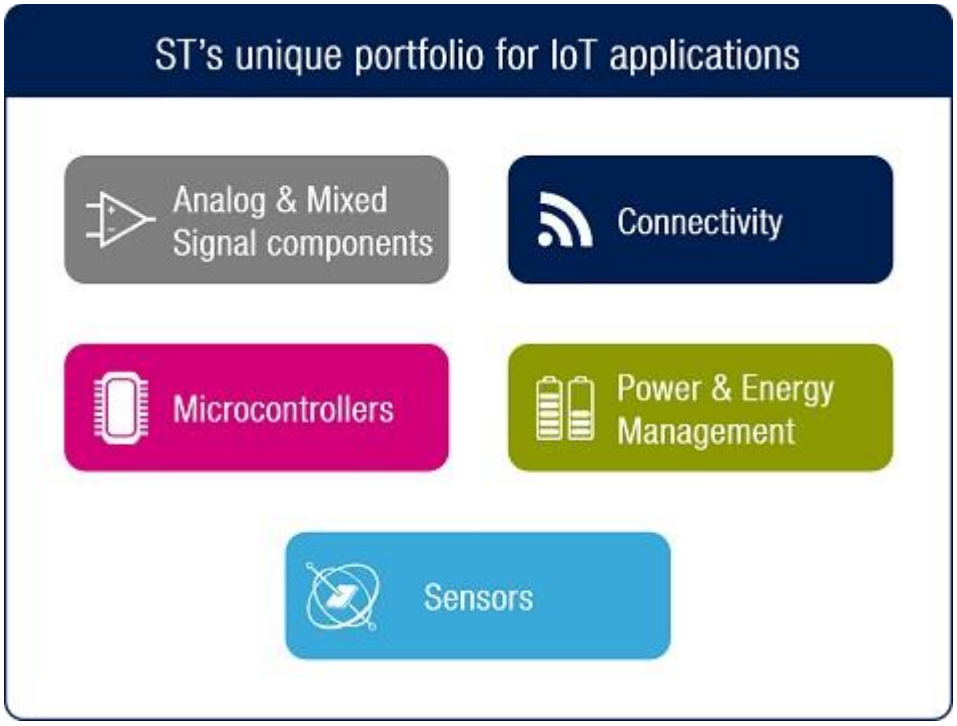
ST sells to major Automotive suppliers such as Bosch, Continental, Magneti Marelli, Delphi and Denso but also has joint developments design centers with many of the top Car manufactures such as Audi and Hyundai.

ST currently ranks globally among the top 3 positions in all its automotive applications.

The Internet of Things - Due to the fragmented nature of the Internet of Things, the markets ST serves is made of large OEM customers as well as of tens of thousands of smaller customers that are served through distribution partners and mass-market initiatives.

The chart 7 below shows the broad portfolio of ST Internet of Things which covers a very broad spectrum of final applications.

Chart 7. Internet of Things portfolio applications



Source: STMicroelectronics website

ST is a leading supplier of all the key technologies going into the next generations of personal consumer devices: Sensors, Microcontrollers for low and ultra-low power processing, Power and Analog components, and RF & Connectivity products.

ST addresses the smart home and smart city systems through energy consumption and management systems, smart grids and their applications.

To keep the technology edge, ST has a very strong commitment to R&D, and almost one fifth of ST employees' work in R&D and product design.

ST spends about 21% of its revenues in R&D, and also owns a substantial patent library made of about 15.000 patents.
ST draws on a rich pool of chip fabrication technologies, including advanced FD-SOI (Fully depleted Silicon-on-Insulator), CMOS (Complementary Metal Oxide Semiconductor), Imaging technologies, RF-SOI (RF Silicon-On-Insulator), Bi-CMOS,BCD (Bipolar,CMOS,DMOS) and MEMS technologies.

ST also owns manufacturing facilities that operate in close proximity with its R&D operations. ST has a worldwide network of front-end (wafer fabrication) and back-end (assemble and test and packaging) plants. ST's principal wafer fabs are located in Agrate Brianza and Catania (Italy), Crolles, Rousset and Tours (France) and in Singapore. They are complemented by assembly-and-test facilities located in China, Malaysia, Malta, Morocco, the Philippines and Singapore.

2.2. ST Capital Structure

2.2.1. Financial liabilities

ST is rated BBB- with stable outlook both from Standard & Poor's and Fitch whereas is rated BA1 with stable outlook from Moody's.

The company has an excellent liquidity profile. As at October 1st 2016 ST reports a net cash position of $ 464 million as a combination of $ 1.67 billion of cash and cash equivalents, $ 342 million of marketable securities and gross financial debt of $ 1.55 billion.

At October 1st, 2016 ST's financial debt was $ 1.553 million (see below Chart 8).

The breakdown of the financial debt, as reported by the Company in its 6K filing to the Security Exchange Commissions at the end of Q3 2016 included

(i) $ 921 million of Senior Convertible Bonds

(ii) $ 623 million of European Investment Bank Loans

(iii) $ 9 million of other funding programs and long term loans and capital leases

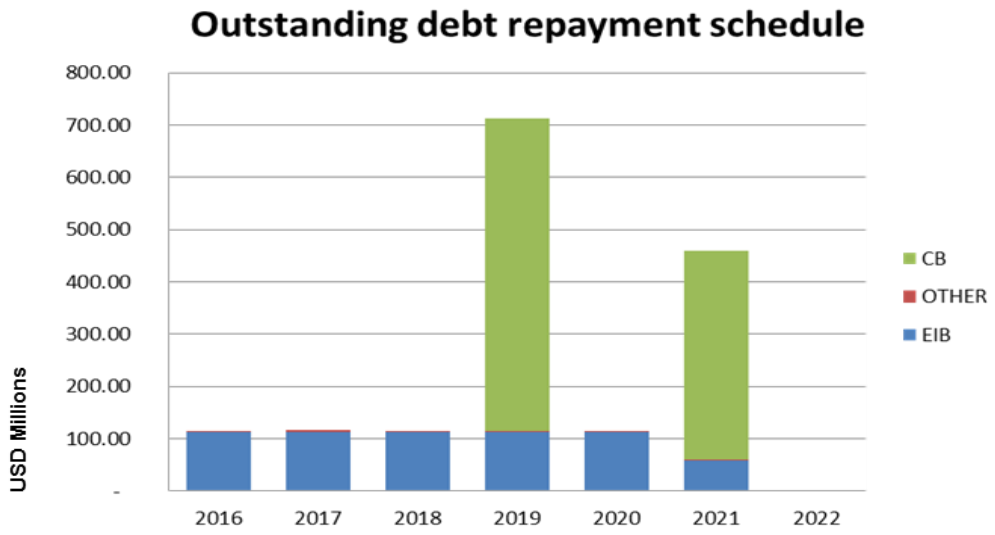
Chart 8. ST Net Financial Position breakdown

Currency :	$K				
COMPANY	LONG TERM DEBTS		SHORT TERM DEPOSITS		TOTAL CASH (NET)
	AMOUNT		AMOUNT	Avg Interest Rate	
ST NV	-1'553'232	0.8398	162		-1'553'070
ST FINANCE BV	-69'769	0.6200	98		-69'671
ST Swiss Branch			1'842'461	1.0731	1'842'461
OTHERS	-9'068	1.7286	172'970	0.1102	163'902
TOTAL	-1'632'068	0.8353	2'015'691	0.9904	383'623
Holland Restricted Cash			899		899
GRAND TOTAL	-1'632'068	0.8353	2'016'589	0.9899	384'521
CB US GAAP ADJUSTMENT	79'373				79'373
US GAAP Values	-1'552'695				463'895

Source: ST Internal presentation

The chart 9 below shows that ST does not have significant debt principal repayments until June 2019 where the first $ 600 million tranche of Convertible Bonds will expiry. The chart does assume a principle repayment in cash even though the Company, in case of exercise of the conversion option by the bondholders, can also opt for the delivery of an equivalent number of shares.

Chart 9. ST Outstanding debt repayment schedule as of October 1st, 2016



Source: ST Internal presentation

2.2.1.1. Convertible Bonds

The Senior Bonds convertible in ST shares were issued on July 3, 2014, for a principal amount of $ 1.000 million (Tranche A for $ 600 million and Tranche B for $ 400 million) due 2019 and 2021, respectively, for net proceeds of approximately $ 994 million.

Tranche A bonds were issued as zero-coupon bonds while Tranche B bonds bear a 1% per annum nominal interest, payable semi-annually.

The conversion price at issuance was approximately $ 12, equivalent to a 30% and a 31% premium respectively, on each Tranche (on the 3rd of October the conversion price has been adjusted up 1.24% on each tranche, pursuant to the dividend adjustment symmetric provision).

ST is a well-known issuer in the equity-linked capital market. Convertible bonds issuance have been since the IPO in 1994 the main source of financing for ST that has benefited from the volatility of its share price as a recurrent technology/semiconductor issuer.

In 2014 ST has issued bonds convertible in its shares at the option of the bondholders benefiting from very attractive $ fixed interest rates in comparison with the alternative conditions available on the debt capital market.

ST primary listing is on the NYSE and the Company reports according to US GAAP.

The convertible bonds issued by ST before 2014 did not have net share settlement feature, contemplating either the repayment in cash of the notional amount or the conversion at the option of the bondholders of the nominal amount in ST shares at the strike price.

With the physical settlement the convertible bond were accounted as 100% financial debt on the balance sheet and the coupon or the yield of accretion in case of zero coupon were accounted as negative interest on the Profit & Loss.

With the net share settlement feature adopted for the first time with the issuance in 2014, ST had to allocate the convertible bond proceeds between debt and equity by measuring first the liability component and then determining the equity component as a residual amount.

According to the information contained in the 20F SEC filings for the full fiscal years 2014 and 2015 and also the most recent 6K SEC filing of October 2016, the liability component of the convertible bonds issued on July 3, 2014 was measured at initial recognition at fair value based on discount rate adjustment technique (income approach). The fair value of the liability component at initial recognition totaled $ 878 million and was estimated by calculating the present value of cash flows using a discount rate of 2.40% and 3.22% (including 1% per annum nominal interest), respectively, on each tranche, as the market rates for similar instruments with no conversion rights.

The liability component of the convertible bonds was subsequently reported at amortized cost. The liability component will be accreted to par value over the expected life of the instrument, five years and seven years respectively for each tranche.

An amount of $ 121 million, net of allocated issuance costs of 1 million, was recorded in shareholders' equity as the value of the conversion features of the instrument.

Transaction costs of $ 6 million were allocated proportionally to the liability and the equity components.

In 2015, one year after the issuance of 2014, ST early adopted the simplified guidance on the presentation of debt issuance costs, which consists in reporting these costs as a deduction of the carrying value of the issued debt and not as deferred charges. The new

guidance was applied retrospectively, which reduced by $ 4 million the amount of the liability component as at December 31 2014.

The adjusted carrying value of the liability component of the issued bonds, net of debt discount and issuance costs, totaled $ 884 million as at December 31, 2014 instead of $ 888 million previously reported.

Unamortized debt discount and issuance costs totaled $ 95 million as at December 31 2015 and $ 116 million as December 31 2014.

The 2014 $1 billion convertible bond issuance, which was shortlisted for the Club the Trente Prix for the most successful financial transaction in France, will be the case study of this thesis.

2.2.1.2. European Investment Bank (EIB) loans

At October 1st, 2016 ST reports $ 623 million in European Investment Bank loans (the "EIB loans") as detailed in the below Chart 10

Chart 10. EIB loans outstanding amount

	October 1, 2016	December 31, 2015
Funding program loans from European Investment Bank:		
0.38% due 2016, floating interest rate at Libor + 0.052%	-	19
1.10% due 2016, floating interest rate at Libor + 0.477%	-	26
1.01% due 2016, floating interest rate at Libor + 0.373%	-	29
1.90% due 2020, floating interest rate at Libor + 1.199%	63	63
1.89% due 2020, floating interest rate at Libor + 1.056%	138	138
0.62% due 2020, floating interest rate at Euribor + 0.917%	69	68
1.44% due 2021, floating interest rate at Libor + 0.525%	180	180
1.54% due 2021, floating interest rate at Libor + 0.572%	173	173

Source: STMicroelectronics NV: Notes to Interim Consolidated Financial Statements

The EIB Loans are comprised of four long-term amortizing credit facilities as part of ST R&D funding programs. The first, for R&D in France, drawn for a total amount of $

341 million, was fully amortized as of October 1, 2016. The second, for R&D projects in Italy, drawn for a total amount of $ 380 million, was fully amortized as of October 1, 2016. The third, a € 350 million multi-currency loan to support the company industrial and R&D programs, was drawn mainly in U.S. dollars for an amount of $ 321 million and only partially in Euros for an amount of €100 million, of which the equivalent of $ 270 million remained outstanding as of October 1, 2016. The fourth, a € 350 million multi-currency loan supporting ST R&D programs, was drawn in U.S. dollars for an amount of $ 471 million, of which $ 353 million is outstanding as of October 1, 2016.

The European Investment Bank (EIB) is the single largest source of bank loans to ST balance sheet and the major funding alternative to equity linked and debt capital markets issuance.

The EIB's mandate is to support projects that make a significant contribution to growth, employment, regional cohesion and environmental sustainability in Europe. Among its priorities there is the area of innovation and skills, since they are considered key ingredients for ensuring sustainable growth and creating high-value jobs. Sustainable growth and creation of high value jobs are for the EIB a top priority since they play an important role in driving Europe's long-term competitiveness.

ST operates in the EIB priority area of Digital Economy that includes research and development and chip manufacturing (Nano-microelectronics) in the semiconductor industry.

The EIB has financed four major projects of ST related to multi years R&D programs in France and Italy from 2006 to 2013 with final maturities up to 2021 according to a 8 years amortizing schedule and for a cumulative amount of Euro 1.2 billion equivalent.

ST invests about 20% of its revenues in R&D with a high percentage concentrated in Italy and France. The important R&D effort in Europe has allowed ST to benefit of the specific EIB's credit facilities to fund innovation in Europe by lending to large Companies with a high creditworthiness profile like ST without the usual bank guarantee requested to the SMEs.

In the 2012 and 2013, before the issuance on the $ 1 billion convertible bond, the EIB was the largest lender to ST with a percentage of 98% of its total financial debts as of 31st of December 2013.

Despite requiring a very lengthy preparation process to usually assess three years R&D programs whose funding has to be shared for 50% between the Company and the EIB, the spread applied on the EIB cost of funding, which is also usually lower than the interbank Libor or Swap rate given the AAA sovereign standing of the EIB, makes the terms and conditions of these loans extremely attractive in comparison with alternative banks loans or straight debt capital markets instruments available at the time of each drawing. These loans indeed do not carry any upfront fees, could be kept undrawn for up to 18 months without any commitment fee, and were paying a credit spread much lower than the relevant period Credit Default Swap of ST at the time of each drawing.

2.2.1. Committed undrawn credit facilities

ST had unutilized committed medium-term credit facilities with core relationship banks totaling $ 563 million as of 31st of December 2015. In order to increase its financial flexibility and improve its cost of carry, i.e. the difference between the interest cost on the financial debt and the interest income on the available liquidity, ST has established since few years a further cushion of committed undrawn back up medium term credit facilities on a bilateral basis with 6 major international core relationship banks. These committed lines are viewed positively by the Rating Agencies since they add financial flexibility, they do not contain financial covenants and Material Adverse Change Clause and have a very limited cost, which is significantly lower than the average yield ST achieves on the placement of its liquidity investments. S&P mentions, in the Liquidity profile of ST which rates strong, among the principal liquidity sources “available committed credit lines maturing beyond 12 months, from different banks, totaling $ 0.6 billion.”

Fitch mentions the importance of size of undrawn credit facilities as an important credit factor for the financial profile of semiconductor companies in its Technology Ratings Navigator Companion for Corporates while Moody’s, in the Liquidity profile which is valued excellent and a strong supporting factor of ST’s Ba1 rating, mentions ST’s access to committed medium term credit facilities of approximately $ 563 Million.

Differently from its equity linked and debt capital market issuances which have been launched with a syndicate of banks, ST has negotiated its committed back up facilities on a bilateral basis, leveraging on its relationship with each single bank from the strength of its very solid capital structure and available liquidity that partially places with each bank providing the committed facilities. In this way ST has managed to obtain better conditions

than those achievable through a syndicate of banks replacing the participants that could no longer guarantee the very low fees available to ST.

Currently the six banks extending the back-up committed facilities on a bilateral basis to ST are JPMorgan, BNPParibas, Societe Generale, Natixis, IntesaSanPaolo and Unicredit each of them for an amount close to $ 100 million.

As of the 1st of October 2016, ST had committed medium-term credit facilities for a total amount of $567 Million (see Chart 11 below).

Chart 11. Committed Lines outstanding amount

Q3 2016	Moody's	S&P	Line Amount (M/US$)
Unicredit	Baa1	BBB-	100
Societe Generale	A2	A	100
Intesa Sanpaolo	A3	BBB-	84
Natixis	A2	A	100
BNP	A1	A	84
JPMorgan	A3	A-	100
Total			**567**

Source: ST Internal presentation

2.2.2. Liquidity

ST balance sheet shows total liquidity for $ 2.017 million at October 1st, 2016 made of $1.675 million of cash and cash equivalents instruments and $ 342 million of marketable securities. Since ST financial assets are mainly composed by short term instruments such as money market deposits, US treasury bills, Money Market liquidity funds and floating rate bonds and a significant part of its current liabilities are also at floating rate, the exposure to interest rate risk is quite limited. The interest rate fluctuations, given the net cash position of ST, may create a mismatch between the liquidity whose interest income is dependent on short term money market rates and the portion of debt with fixed interest rate. Furthermore, when interest rates are extremely low like in the current environment, ST suffers of reduced interest income on its net cash position. ST has been a frequent issuer of Convertible Bonds that are a highly effective instrument to fund the Company in

the equity linked capital market given the high volatility of ST's shares and their market price. ST managed since its IPO in 1994 to raise billions of $ with Zero Coupon Bonds at very low fixed yields in comparison to available free risk rates and reinvesting the liquidity at significant higher yields. Even in the current environment of ultra-low interest rates ST has achieved an average yield on its liquidity of 0.99% at 01 October 2016 versus an average cash interest cost of 0.84% on its long-term financial debt as shown in chart 12 and 13. This result has been partially achieved by reinvesting one third of the proceeds of each tranche of the $ 1 billion convertible bonds issued in 2014 in US Government Bonds with same maturity profile as evidenced in Chart 12.

Chart 12: ST Financial Assets-Liabilities breakdown

Assets (kUSD)	Amount	Rate	Liabilities (kUSD)	Amount	Rate
Total Liquidity	2'016'589	0.9899	EIB Loan ST Finance BV	69'769	0.6200
			EIB Loan ST NV	553'232	1.6347
			Convertible Bonds 2019	600'000	0.0000
			Convertible Bonds 2021	400'000	1.0000
			Others	9'068	1.7286
Total	**2'016'589**	**0.9899**	**Total**	**1'632'068**	**0.8353**

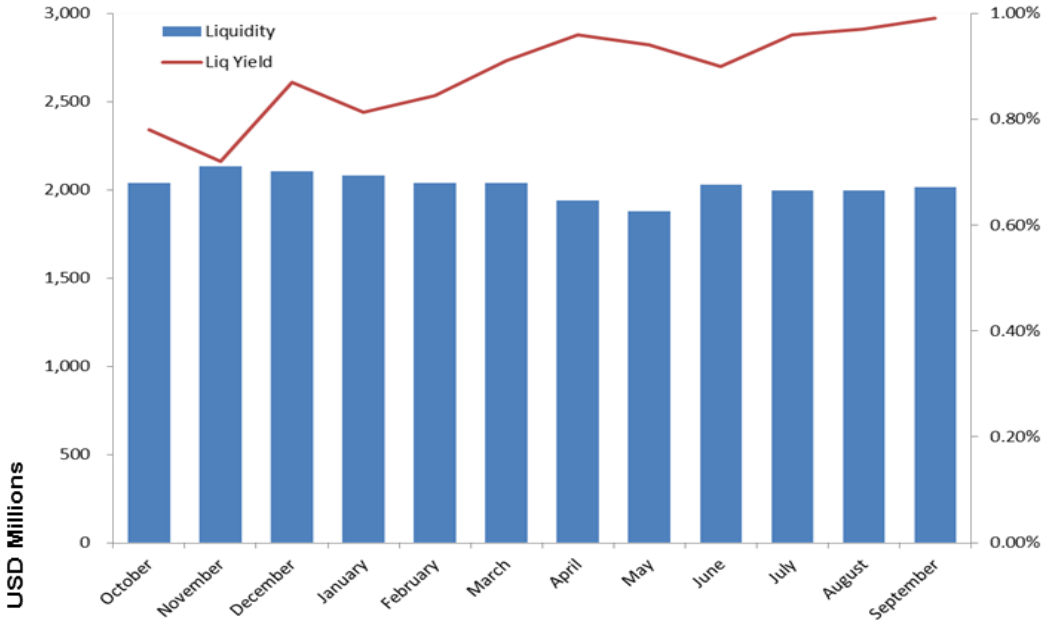
STMicroelectronics Group	Total USD
Current accounts	498'506
Money Market Deposits	1'175'256
US T-Bonds	341'928
Subtotal	**2'015'691**
Other restricted	899
TOTAL	**2'016'589**

Breakdown by Maturity

STMicroelectronics Group	USD	EUR	Total USD
Current accounts and deposits < 1Week	786'995	121'511	908'506
Up to 1 Month	84'353		84'353
Up to 3 Months	680'904		680'904
> 3 Months	341'928		341'928
Other restricted		899	899
TOTAL	**1'894'180**	**122'410**	**2'016'589**

Source: ST Internal presentation

Chart 13: ST Liquidity Yield evolution



Source: ST Internal presentation

2.2.3 Considerations about ST Capital Structure

From the previous paragraphs it does clearly emerge how ST maintains a very solid Capital Structure, with a long term maturity profile of its financial liabilities, a strong level of liquidity which exceeds its debt and an additional buffer of undrawn medium term committed credit facilities granted from its core relationship banks.

We will see in the following chapter of the Credit Ratings that such a conservative financial policy has been instrumental in maintaining an investment grade rating even when the operating margin of STMicroelectronics was negatively affected by the losses in its Wireless Joint Venture with Ericsson and the subsequent restructuring of the Digital set top box business.

Following the significant share price appreciation, which reflects the improved performances of the Company both in terms of gross margin and operating profit, ST could theoretically move from a positive net financial position to a net debt, leveraging its balance sheet to pursue an acquisition of another semiconductor company.

Indeed ST could still maintain a strong capital structure because the higher leverage deriving from an acquisition financing could be counterbalanced by the increased combined EBITDA with the target and a still sustainable Net Debt/EBITDA ratio.

The main characteristics of ST capital structure are the current total absence of any net financial leverage, the capability of the company to issue both straight and convertible debt at very competitive terms with a yield which is even lower than the average return on the short term investment of its liquidity. Furthermore the maturity profile of the debt is well spread over different years to avoid refinancing risk in adverse market conditions and the Company also maintains a further buffer of undrawn committed facilities.

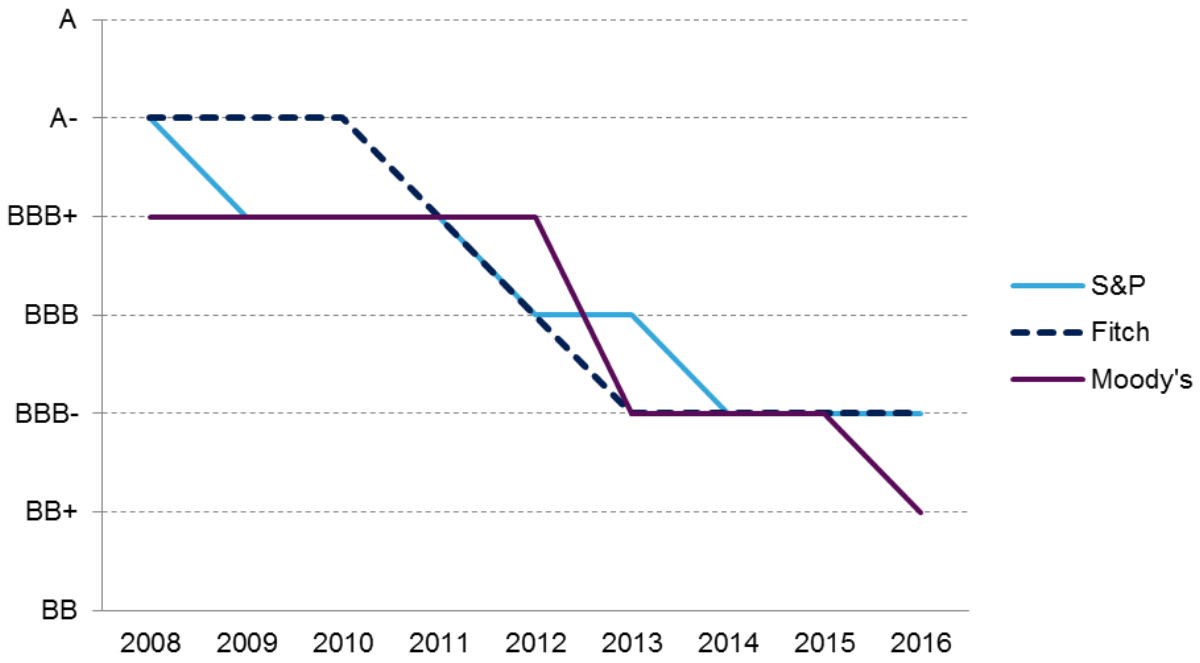
What appears as a very conservative capital structure is however not unusual in the semiconductor industry, which remains cyclical and where the participants need to maintain ample liquidity on their balance sheet to support high R&D expenses to keep the lead on the innovation and significant Capital Expenditure investments.

2.3 Credit ratings

ST is rated on solicited basis by the 3 major international Rating Agencies, Standard & Poor's, Fitch and Moody's. The rating assigned by both Standard & Poor's and Fitch is BBB- with stable outlook whereas Moody's rates ST Ba1, one notch below investment grade, with stable outlook as shown in the chart 14 below.

Despite being participated by the Italian and French governments through the ST Holding which has about 27% of total Shares and nominates 6 out of 9 members of the Supervisory Board, none of the 3 Rating Agencies takes it into consideration basing each respective assigned Rating purely on their internal methodology.

Chart 14: ST Credit Rating evolution



Source: ST Internal presentation

ST has an excellent liquidity profile that is a strong and supporting factor to its credit ratings.

The chart 15 shows the comparison between ST and some of its competitors which are also rated by S&P in terms of liquidity and the most important credit metrics and ratios.

Chart 15. S&P Semiconductors Industry Sector comparison

Industry Sector: Semiconductors

(Mil. $)	NXP Semiconductors N.V.	Analog Devices Inc.	Xilinx Inc.	STMicroelectronics N.V.	Infineon Technologies AG
Cash flow from operations	1,360.2	1,067.8	734.4	882.9	1,013.3
Capital expenditures	353.0	154.0	34.0	565.0	764.6
Free operating cash flow	1,007.2	913.9	700.4	317.9	248.7
Discretionary cash flow	956.2	422.8	381.4	(38.1)	23.2
Cash and short-term investments	1,614.0	3,028.9	3,337.7	2,106.0	2,247.1
Debt	8,551.4	0.0	0.0	67.2	809.2
Equity	11,803.0	5,073.0	2,589.9	4,693.0	5,207.4
Adjusted ratios					
EBITDA margin (%)	25.2	39.9	38.6	14.4	23.4
Return on capital (%)	5.8	20.8	24.3	3.0	10.2
EBITDA interest coverage (x)	6.3	45.1	15.2	15.2	13.2
FFO cash interest coverage (x)	8.6	44.6	20.6	64.6	87.0
Debt/EBITDA (x)	5.6	0.0	0.0	0.1	0.5
FFO/debt (%)	14.5	N.M.	N.M.	1,345.0	153.8
Cash flow from operations/debt (%)	15.9	N.M.	N.M.	1,312.9	125.2
Free operating cash flow/debt (%)	11.8	N.M.	N.M.	472.7	30.7
Discretionary cash flow/debt (%)	11.2	N.M.	N.M.	(56.7)	2.9

N.M.--Not meaningful.

Source: S&P website

As at 31 December 2015 ST reported a net cash position of $ 494 million owing to cash and cash equivalent of $ 1.8 billion, marketable securities of $ 335 million and reported gross debt of $ 1.6 billion. ST also benefits from a balanced debt maturity profile, with no major refinancing requirements over the next 12-24 months and access to committed medium term facilities. These cash sources are more than sufficient to cover the group's cash outflows, such as Capital Expenditure, working capital changes or dividends over the next 12-18 months.

While all the 3 rating agencies recognize to ST a very strong capital structure, prudent financial risk management and proactive liquidity management with a solid standing in the credit markets and strong relationships with its core relationship banks, whose documentation for ST's debt does not include financial covenants, ST has split ratings with both Standard and Poor's and Fitch assigning Investment grade while Moody's has recently downgraded ST one notch below the Investment Grade level.

The main reason for the downgrading from Moody's has been the weak operating margin and cash flow generation. Differently from the two other rating agencies Moody's focuses more on the EBIT rather than the EBITDA and on the discretionary cash flow after dividends rather than the cash flow before dividends.

Finally both Fitch and Standard & Poor's focus on the net debt whereas Moody's takes in consideration the gross debt without adjusting it for the gross liquidity.

It appears that Moody's adopts a very conservative approach which does not reflect the very liquid balance sheet of ST and its capability to maintain a net cash position through the cycle despite the headwinds of the past few years both in terms of business (liquidation of the loss making Joint Venture with Ericsson in the wireless, restructuring of the set-top box activities) and adverse macro scenario (post Lehman Brothers default deep and prolonged recession and demand collapse, European Sovereign debt crisis).

A capital structure analysis based on estimated figures from equity analysts' consensus and current market capitalization shows the following:

Chart 16: Key Ratios

Gross Cash/2016E Sales	**28.5%**
Net Cash/2016E Sales	**7.1%**
Gross Debt/LTM EBITDA	**1.8%**
2016E Capex/Cash Flow from Operations	**(66.6%)**
Gross Debt/Market Cap	**15%**

Source: ST Internal presentation

As mentioned both Fitch and Standard & Poor's focus on the cash flow from operations before dividends distribution.

During the last June 2016 ST Assembly General Meeting (AGM) in Amsterdam it was resolved a new dividend policy to reduce the distribution from $ 0.1 cents per share to $ 0.06 cents per share to be paid quarterly for an absolute reduction on yearly basis of $ 124 million of dividends distributed to the shareholders (from $ 352 million to $ 228 million).

Since all the 3 rating agencies had based their current Ratings of ST on the assumption of unchanged dividends policy of $.10 per quarter, this change should be viewed positively especially from Moody's which has modeled a Free Cash Flow at break- even level in a base case scenario where dividends payments were not reduced.

By comparing the analysis of the 3 rating agencies, which as highlighted before use a different methodology, it appears the following views on ST:

S&P could consider downgrading the rating if:

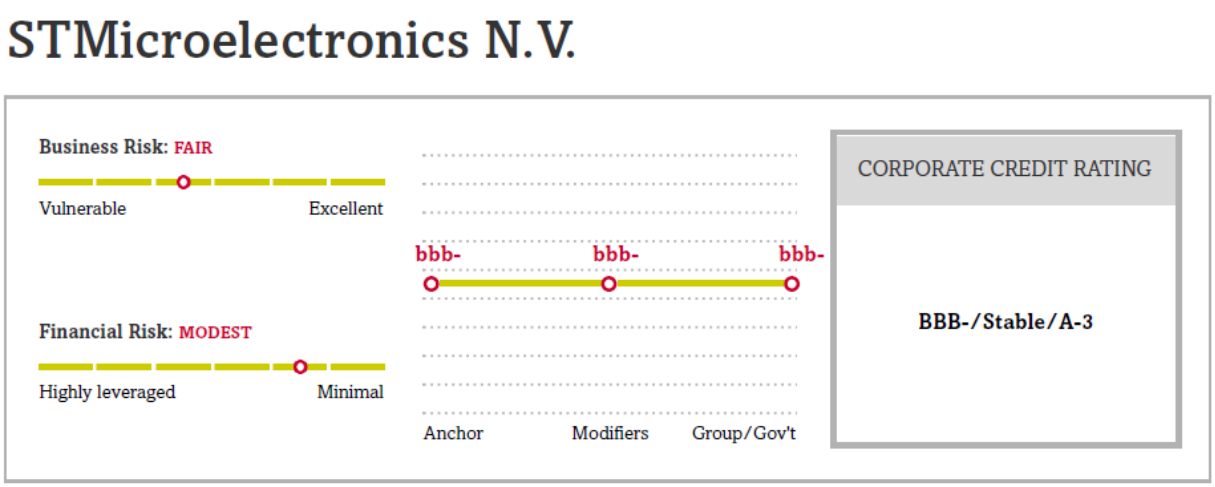
- FOCF were to turn negative
- Aggressive debt-financed acquisitions weakens the balance sheet

S&P could consider upgrading the rating if:

- Solid net cash position is maintained
- Adjusted EBITDA margin reaches at least 20% on a sustainable basis

The below Chart 17 summarizes the Rating BBB+ with stable outlook which derives from S&P internal methodology which combines a business risk judged as fair with a financial risk evaluated as modest detailing in the rationale strengths and weaknesses of the Company.

Chart 17: S&P rating methodology chart



Rationale

Business Risk: Fair	Financial Risk: Modest
• Volatile revenues and relatively low margins compared with peers'. • Exposure to strong cyclical variations in semiconductor demand and severe competition. • High research and development expenses to stay competitive. • Leading market positions in several segments of the semiconductor industry. • Broad product, end-market, and customer diversity. • Long-term customer relationships that provide some protection against competition.	• Strong balance sheet, including maintenance of a solid net financial cash position and high cash balances. • Large fluctuations in cash flow leverage ratios during industry cycles, due to high operating leverage. • Moderate free operating cash flow generation in 2015-2016.

Source: Standard & Poor's presentation

Moody’s could consider further downgrades of ST’s rating if:

- Operating margins were to remain in the low single digit range
- FCF were to turn sustainably negative

Moody’s could consider upgrading the rating of ST if:

- Higher profitability, and better utilization rates were realized translating into lower unused capacity charges
- Operating margins were in the mid to high single digit range
- FCF to debt of 5%10% through the cycle

It is interesting to observe how the 3 Rating Agencies rely on different proprietary methodologies to assess the credit risk of ST.

As mentioned above Moody’s is the only Rating Agency which focuses on the gross rather than on the net debt and furthermore considers the “discretionary” cash flow which equals to the net operating cash flow from operations minus the dividends paid whereas both Fitch and S&P consider the absolute level of FCF.

Besides that Moody’s is the only Rating Agency which has developed an in house global semiconductor industry methodology which is based on broad rating factors and sub-factors as shown the below Chart 18. Moody’s scores 5 different factors based on last 36 months averaging the ratings indicated from the grid and correcting it with an internal 12-18 months forward view. It appears very clearly the weight that Moody’s assigns to the profitability, which is the main negative factor for the Rating one notch below investment grade.

Chart 18: Moody's rating methodology chart

600038815

Rating Factors

STMicroelectronics N.V.

Semiconductor Industry Grid [1]	Current Preliminary 2015		Moody's 12-18 Month Forward View As of 2/18/2016 [3]	
Factor 1 : Scale (20%)	**Measure**	**Score**	**Measure**	**Score**
a) Revenue (USD Billion)	$6.9	A	$6.9 - $7.1	A
b) Free Cash Flow (USD Billion)	$0.0	Ca	$0 - $0.1	B
Factor 2 : Business Profile (20%)				
a) Business Profile	Baa	Baa	Baa	Baa
Factor 3 : Profitability(5%)				
a) EBITDA Margin	13.4%	B	13% - 15%	B
Factor 4 : Leverage & Coverage (40%)				
a) Debt / EBITDA	2.5x	Ba	2x - 2.4x	Baa
b) EBIT / Interest Expense	2.6x	Ba	6x	Baa
c) Cash / Debt	90.7%	Ba	90%	Ba
d) FCF / Debt	-0.9%	Ca	0% - 5%	Caa
Factor 5 : Financial Policy (15%)				
a) Financial Policy	Baa	Baa	Baa	Baa
Rating:				
a) Indicated Rating from Grid		Ba3		Ba1
b) Actual Rating Assigned				Ba1

[1] All ratios are based on 'Adjusted' financial data and incorporate Moody's Global Standard Adjustments for Non-Financial Corporations.

[2] This represents Moody's forward view; not the view of the issuer; and unless noted in the text, does not incorporate significant acquisitions and divestitures.

Source: Moody's report

Fitch could downgrade ST if

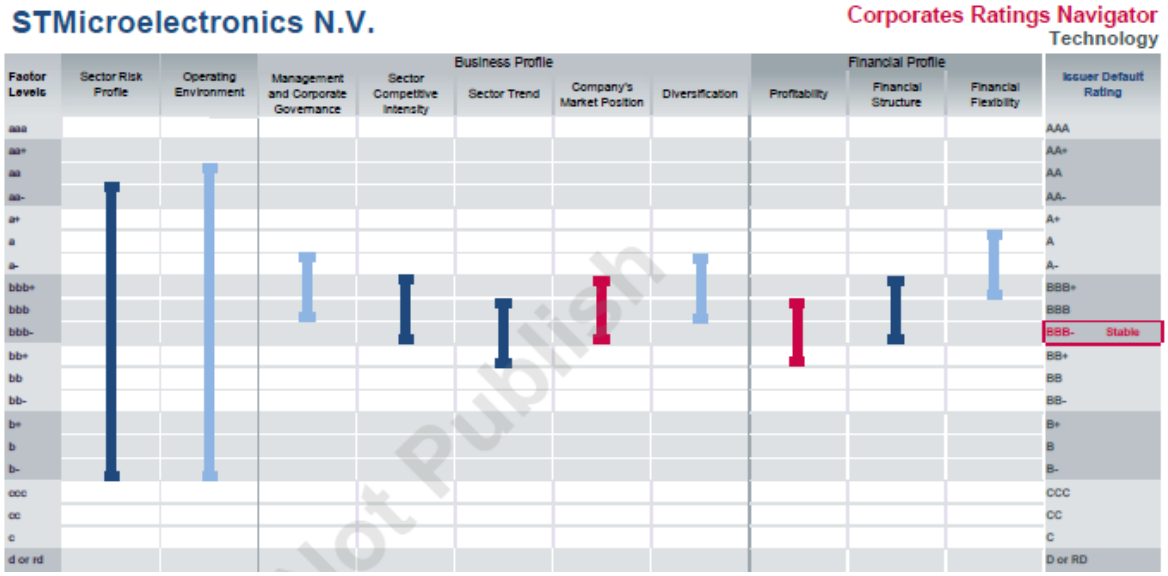
- Operating margins were to remain below the expected 8-12% range
- FCF not able to sustain restructuring processes and R&D

Fitch could consider upgrading the rating if ST

- Operating margins were to improve substantially
- FFO profitability was to improve

As shown in the below Chart 19 the Fitch methodology, called Corporate Rating Navigator, is more similar to the one of S&P which combines the business together with the financial profile.

Chart 19: Fitch rating methodology chart



Source: Fitch Ratings presentation

Case Study – $ 1 Billion dual tranche 2019 and 2021 Senior Convertible bonds

3.1 Why issue a Convertible Bond?

The use of a Convertible Bond as a debt instrument for an issuer provides a certain number of advantages compared to a basic straight bond issuance. A non-exhaustive list includes:

Low Cost Financing

The major advantage of a convertible bond is its lower yield, significantly below the cost of straight debt with same maturity. Depending on certain conditions and in certain countries, the full cost of debt is tax-deductible. The Convertible Bond gives the issuer the ability to monetize efficiently the stock price volatility, through the sale of the conversion option to the bondholders.

Equity raised at a premium

Through a Convertible Bond, the issuer potentially raises equity at premium versus the current market share price. The issuer can model a certain risk profile structure which combines a lower level of interest expense with a potential dilution for the existing shareholders at a significant higher share price.

Stake management

Listed companies can achieve an efficient stake management taking advantage of their share price volatility as an alternative funding source.

Acquisition financing

Lower coupon interest yields helps to minimize the negative effects on the cash flow which is impacted by the acquisition financing costs. The potential dilution in case of conversion from the bondholders is mitigated by the Conversion premium obtained.

Access new investor base

Investors in Convertible Bonds belong to a specific asset class category that usually doesn’t invest in Fixed Income Bonds. By issuing Convertible Bonds, the company therefore achieves diversification of its funding sources tapping an alternative class of investors.

Execution

Under certain financial markets circumstances, the issuance of a Convertible Bond can be executed rapidly through very light documentation without the need of prospectus.

Positive market reaction

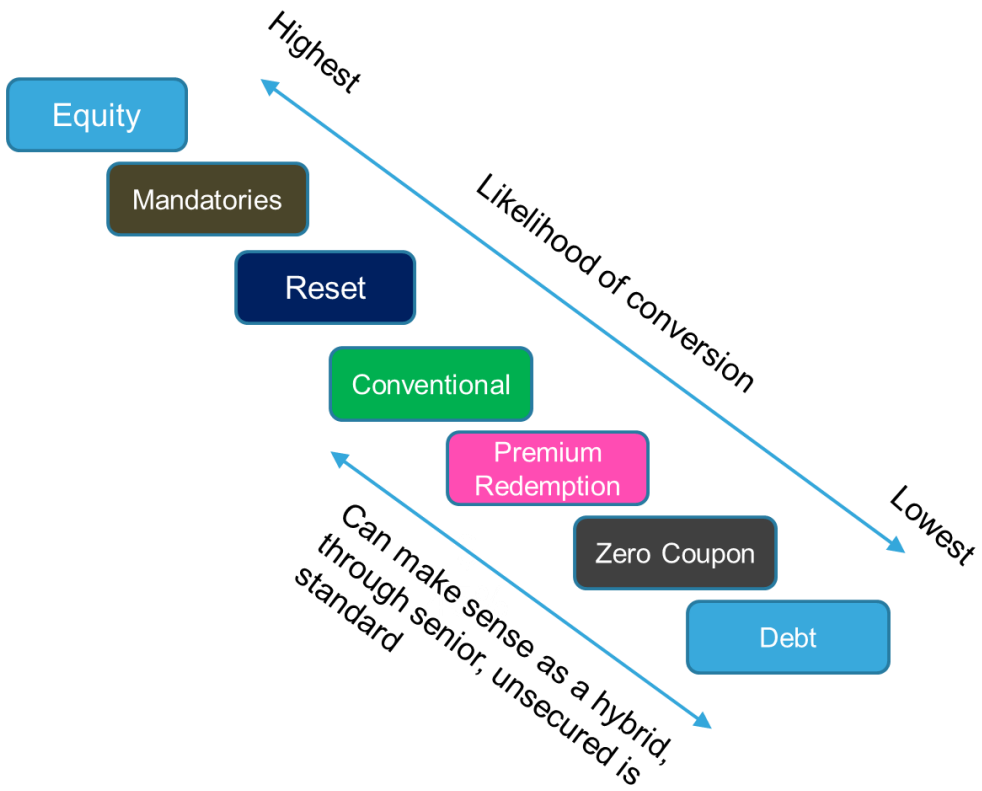
The bondholders who invest in a new Convertible Bond issuance with conversion premium signal to the market their belief in the upside of the company's share price

Rating agency equity credit

A convertible can be structured with hybrid features to achieve a 50-75% equity credit from the Rating Agencies.

The spectrum of available structures varies between very different instruments depending on their similarity to debt or equity as represented in the Chart 20:

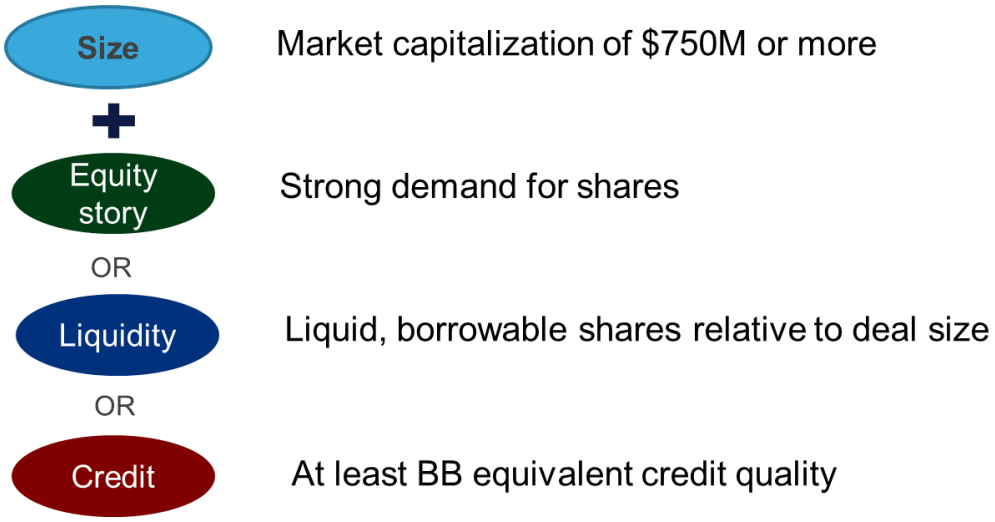
Chart 20: Different Equity linked products



Source: UBS presentation and personal elaboration

A company can contemplate to issue Convertible Bonds only when some conditions are met. The Chart 21 shows the minimum conditions necessary to issue a Convertible.

Chart 21: Preliminary conditions to issues a Convertible



Source: UBS presentation and personal elaboration

The pricing of a Convertible Bond can be obtained through the simple standard model, by summing the Straight Bond Value to the Option (Warrant) Value. This model is valid when the convertible instrument can be physically splitted into a straight bond and an option or a warrant, or for the basic structures of convertibles which do not have many unconventional features. The option or warrant can be separately priced through an Option Model (such as Black & Sholes).

However when the credit risk evaluation and other important “Sensitivities” such as interest rate and stock volatility do have an important influence on the pricing, the above simplified pricing approach cannot be adopted any longer, and some integration to the model have to be introduced. In the Chart 22 there are listed all the inputs (“sensitivities”) which are relevant for the pricing of a convertible bond in the three possible scenarios of Out of the Money, At the Money and In the Money.

Chart 22: Convertible Bond Sensitivities

Factor	OTM	ATM	ITM
Stock Price, i.e. equity delta	0	+	++
Stock Volatility, i.e. equity vega	0/+	++	0/+
Stock Dividends	0	+	++
Stock Borrowing Cost	0	+	++
Interest Rates (risk-free), i.e. rho	––	–	0
Interest Rate Volatility, i.e. interest rate vega	0	+	0
Credit Spread (or default probability)	––	–	0
Time to Maturity	–	–/+	0/+
Coupon Rate	++	+	0/+
Redemption Price	++	+	0
Conversion Ratio	0	+	++
Time to First Call Date	0	++	+
Call Trigger Level	0	++	+
Call Prices	0	++	+
Time to Puts	––	–	0
Put Prices	++	+	0
Exchange Rate (stock currency units per bond currency unit), i.e. FX delta	0	–	––
Exchange Rate Volatility, i.e. FX vega	0/+	++	0/+

Source: Barclays Capital Convertibles Bonds

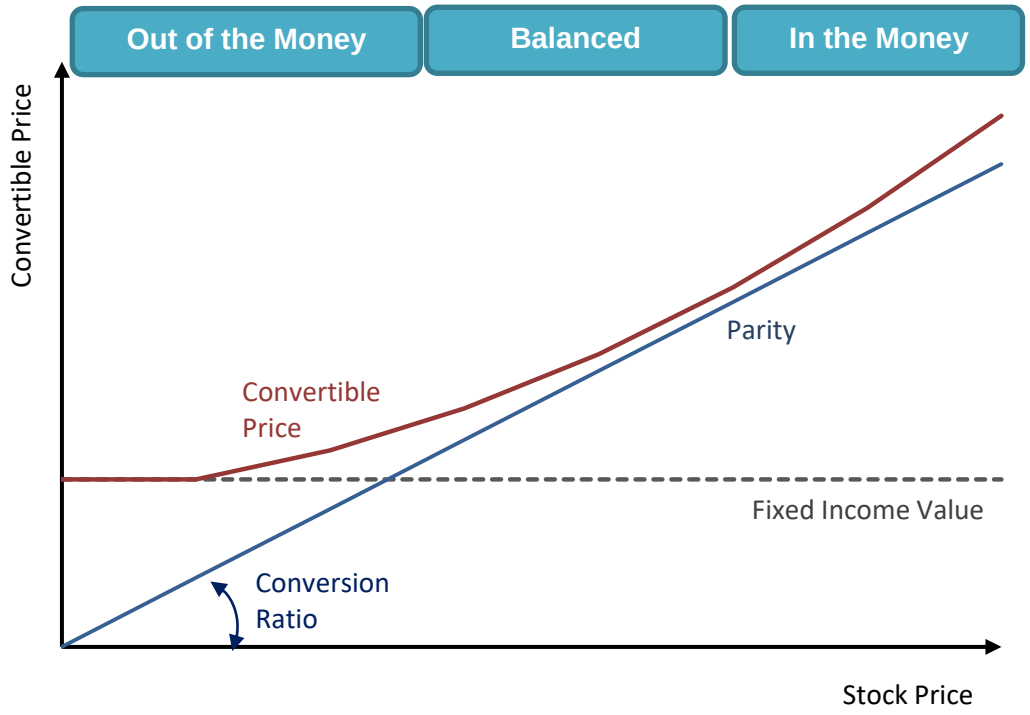
The Volatility effects impacting Stock and Interest Rates, are greater when the options are approximately at the money, and have less effect for deep in and out of the money options. A long time to maturity negatively affects the bond-like portion of a convertible instrument because its yield is usually significantly below the market's risk-free interest in order to compensate for the sale conversion option. On the other side, the longer the expiration of the convertible bond, the greater will be the value of the conversion option necause of the associatedtime value.

Deep In the money convertibles trade above parity and when the yearly return of the bond exceeds that of the stock (Dividends), the bondholders would hold rather than convert the instrument to make further advantage of the residual time value. Issuer calls effectively limit the upside potential and time value in a convertible bond, so later call start dates, higher trigger levels and/or higher call prices for the issuers are positive for the

bondholders. Investors puts offer downside protection on specific future dates, so bondholders prefer to get as many puts as possible, sooner rather than later and at high stock prices.

In the Chart 23 is described how the traditional convertible bond reacts to movements in share price in an environment of not changing interest rates. On this Chart the line labeled “Fixed Income Value” represents the value of the instrument to bond investors in the absence of an equity option. This fixed income value (also called Bond Value) will be affected by a number of factors but in this simple analysis it is not correlated with movements in share prices. By definition the equity value of a convertible instrument changes according to the underlying share price because an equity-linked instrument allows the investor to convert the bond into a predetermined number of shares. The number of shares to which an investor is entitled per convertible instrument is called the conversion ratio. The “Parity” shows the equity value embedded within the convertible bond. Parity is the share price multiplied by the conversion ratio and therefore it increases pro rata together with the share price.

Chart 23: Basic Convertible Price Behavior



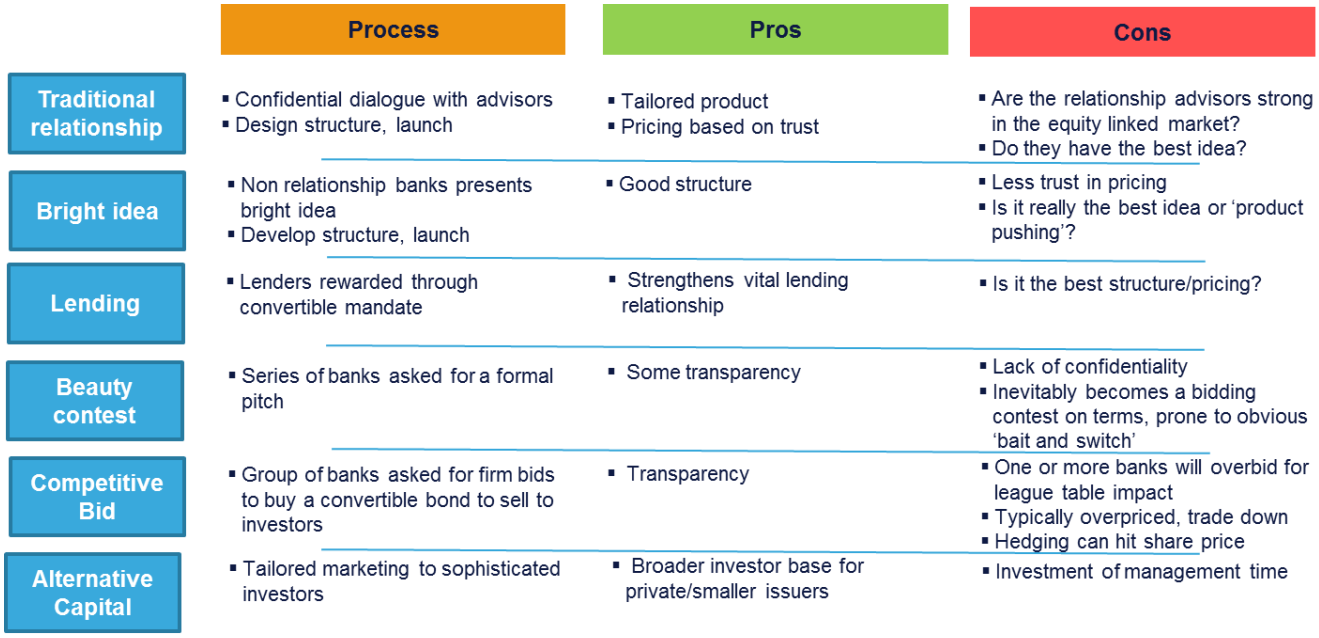
Source: Barclays Capital Convertible Bonds

In principle, an equity oriented investor should be willing to pay at least parity for a convertible. If a convertible bond trades significantly below parity, then arbitrageurs would buy the convertible and convert it into shares to achieve a riskless profit. Equity investors may be willing to pay a premium over parity (the conversion premium) to own a convertible and fixed income investors may be willing to pay a premium (the risk premium) over the intrinsic investment value. The Chart 23 illustrates the concept of premium. In the areas labeled In the Money, Balanced and Out of the Money, the Parity and the Fixed Income value lines determine the lower bounds of the convertible's price. The convertible's value will at least lie on this boundary, and in most cases the actual convertible price will be at a premium to these values.

A wide range of issuers with different credit ratings and industrial sectors are present on the Convertible Bond market. Sub-investment grade and unrated issuers represent the majority of the bond issues, given the very significant benefit to their cost of borrowing. For the same reason there is a scarcity of investment grade issuers who do have easy access to Debt Capital Market without having to pay the interest rate associated to High Yield Bonds.

The selection process needed for a Convertible issuance can be summarized in the following phases and steps in Chart 24.

Chart 24: Phases to issue a Convertible



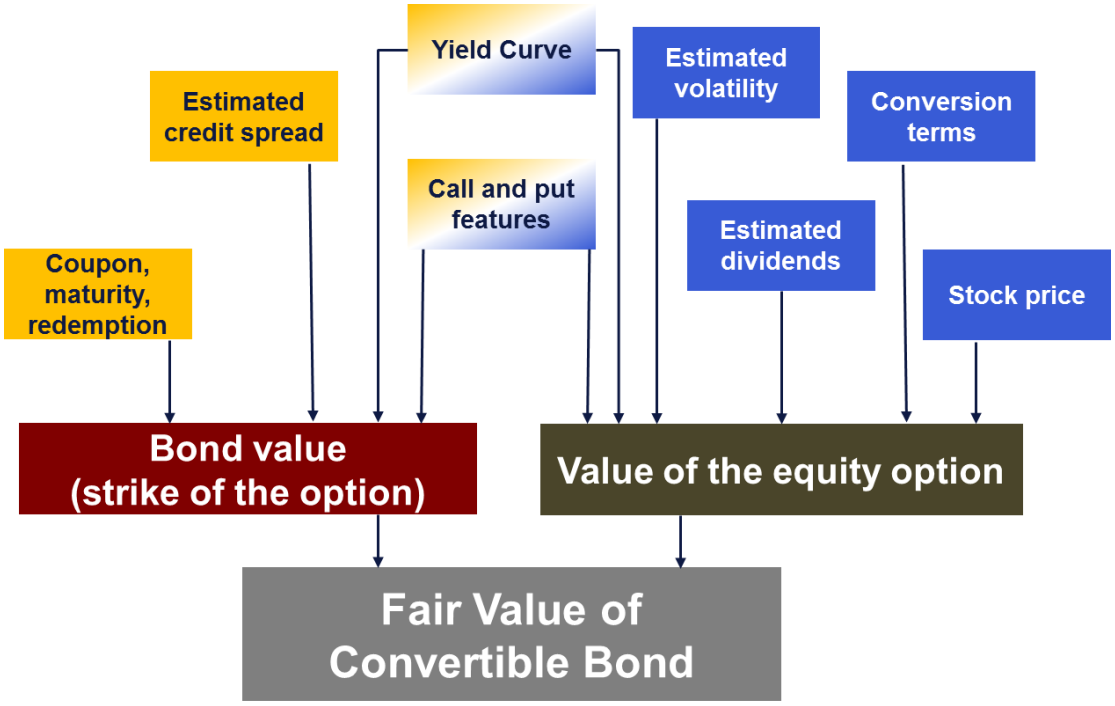
Source: UBS presentation and internal presentation

Some important milestones have to be reached to meet some pre-conditions in a preparatory phase such as Assembly General Meeting/Supervisory Board authorizations, appointment of global coordinators and legal advisors. This phase takes at least 4 weeks but could be more time consuming when it is the first issuance and the company's decision making process is implemented for the first time. When the preliminary steps are accomplished, the procedure of the launch lasts a few hours through the advertising of the issuance, publishing of the terms and conditions, final decision on premium and coupon. The next phase is the book-building based on the sales strategy and the relationship with the global coordinators. After this step the Convertible Bonds are issued and start trading on the Grey Market, impacting also the share price which comes under natural pressure because of the underlying number of shares. The aftermarket reaction is very important to understand how the market has perceived the issuance, if the premium has been well priced and if the demand from investors has been sufficiently high to grant good liquidity to the after issuance trading.

3.2 Global Convertible Bond Market

In order to better explain the reason why a specific asset class of investors would buy an Equity-linked instrument, it is important to understand the variables which influence the Fair Value of a Convertible Bond (see Chart 25).

Chart 25: Variables which influence the Fair Value of a Convertible

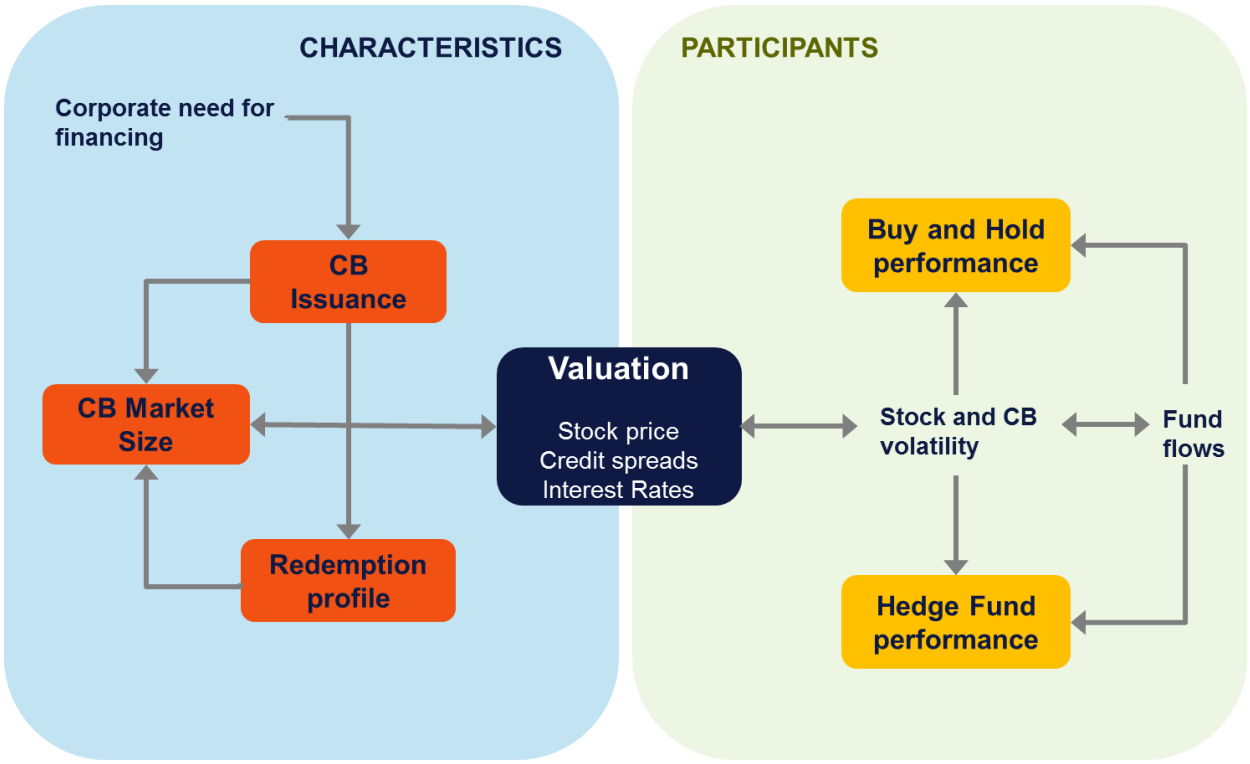


Source: UBS presentation and personal elaboration

The Convertible Bond therefore is defined as a corporate security whose volatility and expected returns are less than those of an issuer's common stock but greater than those of an alternative straight debt instrument. Convertible Bonds are not, however, a mere combination of a company's equity and fixed income securities. Convertibles Bonds are a separate asset class that can uniquely meet a broad array of issuers and investor objectives. Considering the investors classes who are capable to evaluate all the variables which influence the Fair Value of a Convertible Bond, two main categories could be identified, the "Buy and Hold" investors and the Hedge Funds.

The Convertible Bond market in a nutshell can be represented by the scheme in Chart 26:

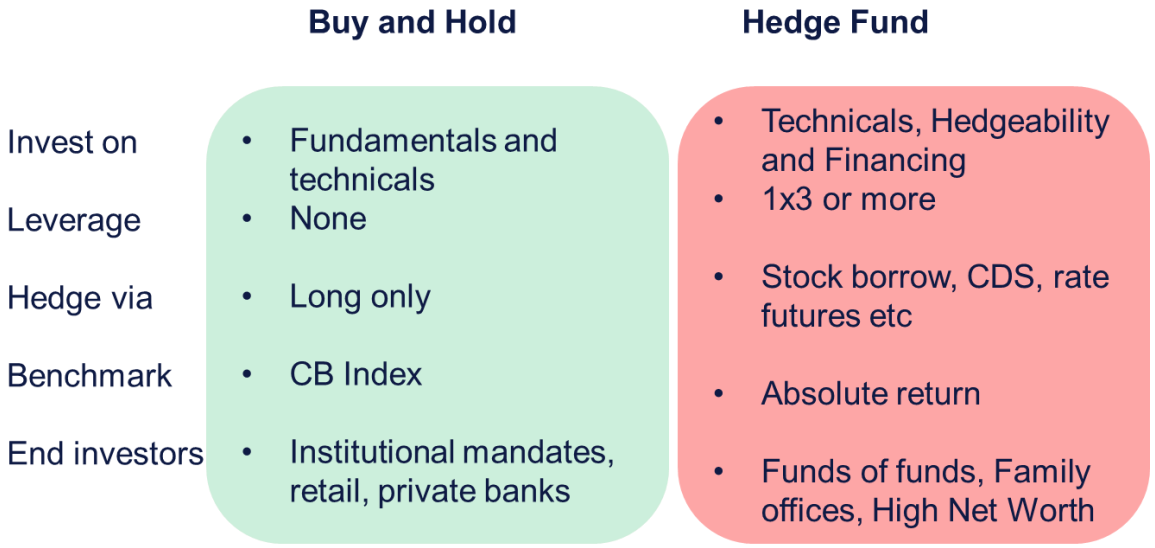
Chart 26: Convertible Bonds Market



Source: UBS presentation and personal elaboration

From one side the issuers are Companies who have specific needs of financing in terms of size, redemption maturities and features. On the other side the buyers of a Convertible Bonds may be very sophisticated investors such as the Hedge Funds, who evaluate carefully all the variables influencing the fair value of an issuance and rarely hold the Bond for a very long period, looking at possibilities of arbitrages (see Chart 27). There is also another category of investors which can be more or less sophisticated, represented by Asset Managers, Financial Institutions and Fund Managers which invest in Convertibles Bonds only, which is typically named “Buy and Hold” because of the likelihood they will keep the Bond until their maturity.

Chart 27: Convertible Bonds buyers

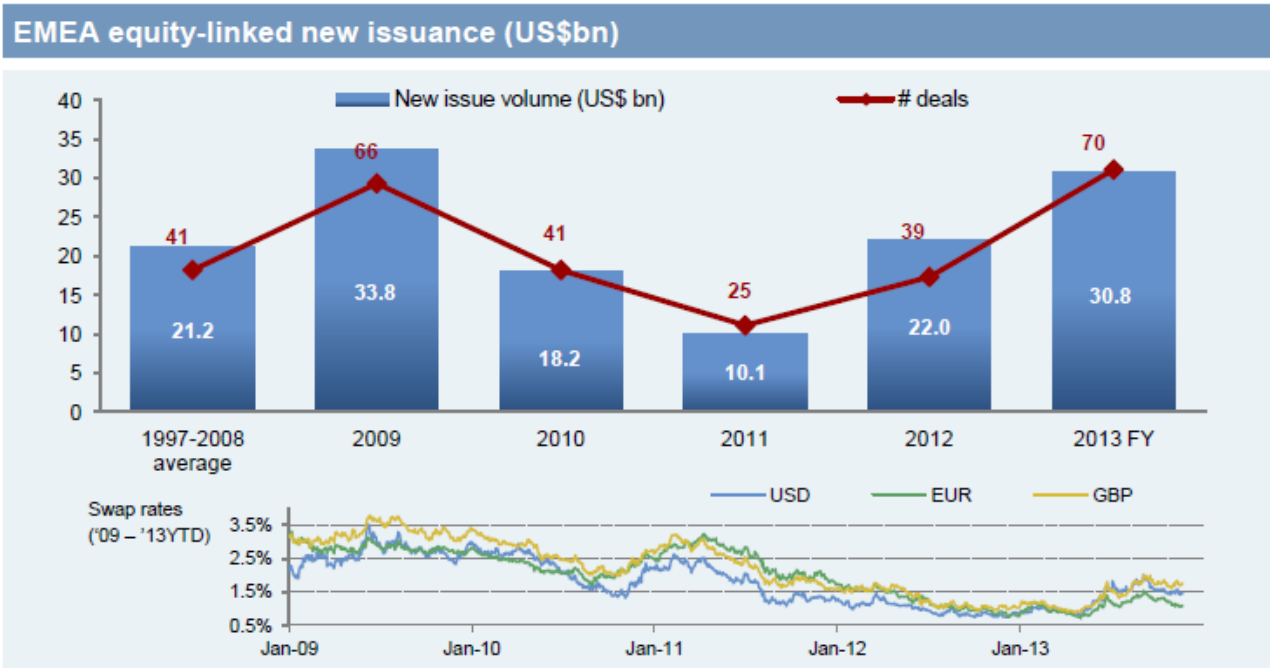


Source: UBS presentation and personal elaboration

Sometimes it is difficult to clearly differentiate these two asset classes since there may be instances when Hedge Funds behave just like Buy and Hold investors.

The size of the EMEA Convertible Market is represented in the Chart 28 which shows the trend of new issuances significantly increasing in the last few years, despite interest rates have reached historically low levels following the financial crisis of 2008 and the South European sovereign debt turmoil in 2011.

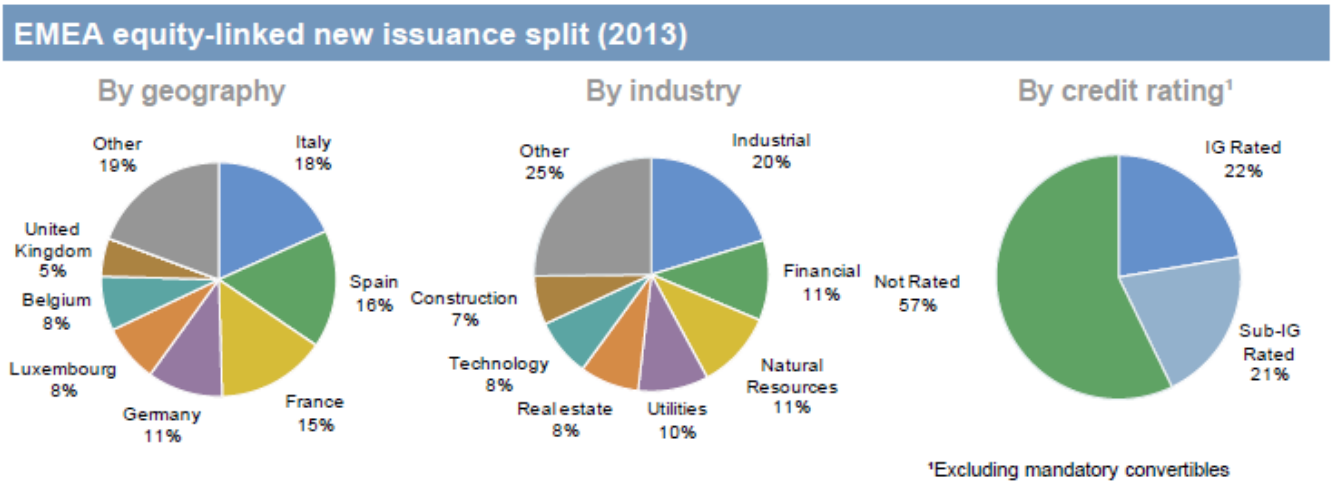
Chart 28: EMEA Equity Linked transactions



Source: JPMorgan presentation, 2013

Looking more in detail at the EMEA Equity–linked market, the Chart 29 represents the split by geography which reflects the presence of large multinational groups and by industry which looks very even. Very interesting is the split by credit rating, which highlights the structural scarcity of Investment Grade issuers in this market.

Chart 29: EMEA Equity Linked split



Source: JPMorgan presentation, 2013

3.3 Issuance of ST $ 1 billion convertible bonds

As already mentioned in paragraph 3.1 there are a number of advantages to issue a convertible bond in alternative to straight debt.

The issuer can achieve a lower cost of financing, raise additional equity at premium versus the current share price, take advantage of the volatility of the share price which tends to be much higher for tech listed companies, raise sources for future acquisitions and also diversify its funding with a different asset class of investors.

Most of these advantages drove the issuance of $ 1 billion dual tranche of convertible bonds by ST Microelectronics

At the beginning of 2014 ST indeed decided to access the equity linked capital market in order to:

a. Strengthen its capital structure by
    i. maintaining high liquidity buffer
    ii. extending the debt maturity profile
    iii. pre-empting amortizing debt repayment for the next 3 years
b. Diversify its source of funding complementing existing European Investment Bank facilities and further lowering the average cost of debt (at that time an all-in of 0.67%)
c. Obtain attractive terms taking advantage of very favorable market conditions
d. Enhance financial flexibility
    i. To secure optimal funding that may have not been available in the future at the same conditions in case of market deterioration
    ii. To support M&A opportunities and investment plan

On June 26th 2014 ST issued $ 1 billion in 2 tranches with the following terms and conditions

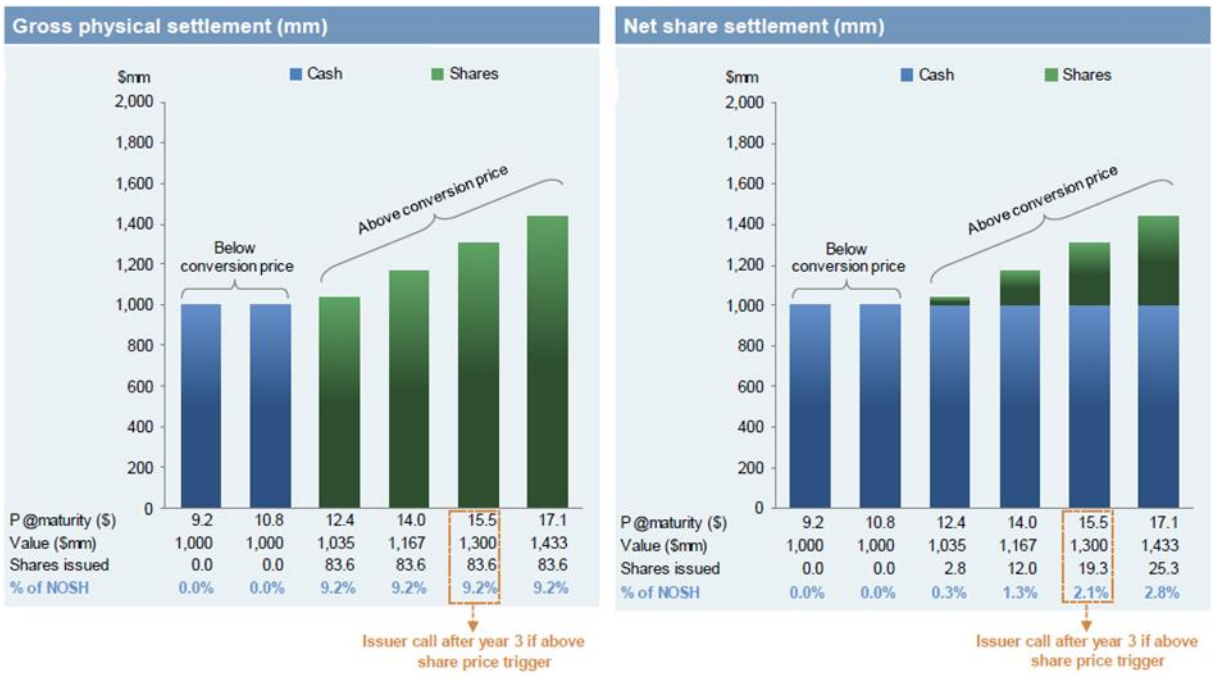
- $ 600 million 5 Years – zero coupon/yield at 30% premium (conversion price $ 11.98)
- $ 400 million 7 years – 1% coupon/yield at 31% premium (conversion price $ 12.08)

ST selected a balanced syndicate of relationship banks led by BNP Paribas and JP Morgan as Global Coordinators.

3.3.1 Net share settlement feature, Soft Calls and symmetric dividend protection

The Net Share Settlement feature was elected at the issuer option to redeem either in cash or in ST shares. Upon a conversion request, ST will have a number of days to decide whether it wants to deliver shares, cash or a mix of cash and shares. In whatever case the value for the investors is the same regardless of how settlement is designed. A Net Share settled convertible structure reduces the number of shares delivered upon conversion and provides a clear liability at maturity (see Chart 30).

Chart 30: Net Share Settlement option



Source JPMorgan presentation

The maximum number of shares to be delivered under a Physical settlement (83.2 million for ST Bonds) was reduced through the Net Share Settlement to 19.2 million in the hypothesis of a Soft Call exercised by ST at 130% of the conversion price.

A Convertible Bond issuance usually contains a Soft Call feature granted to the issuer who can recall the outstanding Bonds if certain market conditions are met, namely if the share price increases so much that the dilution effect becomes unbearable. Generally the Soft Call has a final maturity which corresponds to the maturity of the Convertible Bond and a starting date which depends on the maturity of the Bond (the longer the tenor, the longer

the life of the Soft Call). A Convertible Bond which has at least 5 years maturity, as a general market practice, is not callable from the issuer for the first 3 years but is callable afterward until maturity if the share price trades above 130% of the conversion price for 20 consecutive open days. This option, which has a strike very far from the share price at issuance (30% of the Soft Call plus the conversion premium), does not have a big impact on the pricing of the Bond since the event is considered very unlikely from the investors.
ST has been able to obtain a double Soft Call option for each tranche of its Convertible Bonds

- After 2 years at 150% and after 3 years at 130% for the 5 years tranche
- After 3 years at 150% and after 4 years at 130% for the 7 years tranche

without having any impact on the pricing at issuance while having a protection mechanism to mitigate dilution in case of an exceptional share price increase during the life of the Convertible Bond.

Since ST has been granted these Soft Calls, the Net Share Settlement maximum dilution has been calculated in the hypothesis of ST exercise of the Soft Calls. Theoretically during the first years from the Issuance when the Soft Calls are not available (the *lock-up* period), the share price could increase so significantly to have the Conversion Option exercised by the bondholders but this event was so unlikely that the Company did not consider in its "what if" scenario considering the case of a limited number of shares to be delivered as the most probable.

The dividend protection is a standard feature of a Convertible Bond which protects the Bondholders in case the issuer decides to distribute extraordinary dividends or changes its dividend policy. Since the dividend is the remuneration of the equity investors which a bondholder is available to give up when invests in a Convertible Bond, it is common practice to include a clause for the bondholders to protect them from dividend increases, also for companies like ST which had already a significant dividend yield.
The existence and the mechanism of such a clause has an important impact on the pricing a new Convertible Bond. ST, which used in its previous issuances to grant the bondholders a dividend protection against an increase of dividends above a certain threshold (generally the dividend distributed at the time of the issuance), negotiated with the Global Coordinators a symmetric issuer protection in case of a decrease of dividends distributed. Indeed if the dividend distributed decreases, the equity investors would be

penalized versus the bondholders and therefore a mechanism of upward adjustment of the conversion price would make the event neutral for both the investors' classes. At the time of issuance it was estimated by the Company that this symmetric dividend protection would have not significantly impacted the pricing of the Convertible Bond.

3.3.2 ST shares buy back

As described in the previous paragraph, the Net Share Settlement mechanism has dramatically reduced the maximum number of shares to be distributed upon conversion of the Bonds and through the potential exercise of the Soft Calls, ST was able to limit significantly the maximum number of shares to be delivered upon conversion.

If ST had bought the same number of shares from the open market, keeping them against the potential future conversion of its bondholders, the company would have achieved a neutral position from the dilution of its shareholders.

As the majority of listed companies which usually have remuneration plans for managers based on shares (Stock Options plan, Grant options etc.), ST holds a certain number of its own shares, classified as Treasury Shares. These shares are repurchased from the Stock Exchanges where ST is listed through Buybacks programs which can be conducted through different operational techniques.

A common rule is that the Issuer cannot manage the Buyback since it has not public available information which may raise insider trading conflicts. As done in the past ST gave a firm upfront mandate to a Broker to execute a share buy-back program based on predefined rules without any issuer's interaction to avoid having the Company in a different position versus all the other market participants.

For the purpose of achieving zero dilution for its shareholders, ST decided to launch a Buyback of 20 million shares immediately after the issuance of its Convertible Bond. As highlighted in the paragraph 3.2.1, the Company calculated a maximum amount of 19.2 million shares to be delivered through the Net Share Settlement in the hypothesis of a soft call exercised by ST at 130% of the conversion price. In case these Bonds were not converted by the bondholders, the shares repurchased would remain available for future remuneration plans of ST employees as Treasury stock.

The 20 million shares Buyback was executed by Societe Generale on the Milan Borsa Italiana which is the most liquid Stock Exchange where ST is listed (the New York Stock

Exchange and the Euronext in Paris have a lower degree of liquidity) , through an Open Market methodology. The broker was mandated to buy a total maximum number of 20 million shares, with a fixed final date and a maximum of 10% of the daily volumes to avoid impacting significantly any specific trading day operation of ST shares on the Borsa Italiana. ST could not change any parameter of the buyback mandate until it was fully executed. The beginning of the buyback was announced to the financial market at the issuance of the Convertible Bond.

The buyback execution lasted from the 7th of July to the 10th of November, 2014 for a total consideration of $ 155.7 million (at an average price of $ 7.7858). The decision of executing the buyback along a period, instead of concentrating it on a single day, was very rewarding for ST since the average price was finally significantly lower than $ 9.20, share reference price at issuance of the convertible bonds.

The decision to totally offset dilution thorough the combination of the Net Share Settlement and the 20 million share buy-back have proved to be very effective and the lower cost of $ 28 million on the repurchase program has further improved the exceptional terms and conditions of the $ 1 billion convertible bonds issuance. Finally, given the very high dividend yield of 6% at the time of issuance, the share buy-back has contributed to further improve the Company's cash flow because of the savings of about $ 10 million of dividends in addition to the very low all in weighted cost of 0.40% of the 2 tranches of convertible bonds.

3.4 Post Issuance trading performance

The main Convertible Bond post issuance highlights can be summarized as follows:

- Customized structure with net share settlement, issuer call in two steps for each tranche and upward and downward dividend protection when market standard is only upward protection
- Attracting window opportunity with the issuance launched in the context of lack of supply of investment grade paper with ST rated at that time BBB by S&P and Baa3 by Moody's
- First transaction in $ priced at 0% coupon and 0% yield to maturity since 2007
- Optimal execution in a very tight window of 48 hours before blackout period after receiving EU clearance on NANO17 R&D grants program. Only 24 hours between

first discussions with banks and pricing the issuance including a formal request for proposal

- Excellent results with almost no share price impact despite the significant size of the issuance. The convertible reference price was almost unchanged versus the previous day closing price enabling to target higher conversion prices
- Long only investors (or “Buy and Hold”) bought the majority of the bonds (61% of the 5 years tranche and 84% of the 7 years tranche)

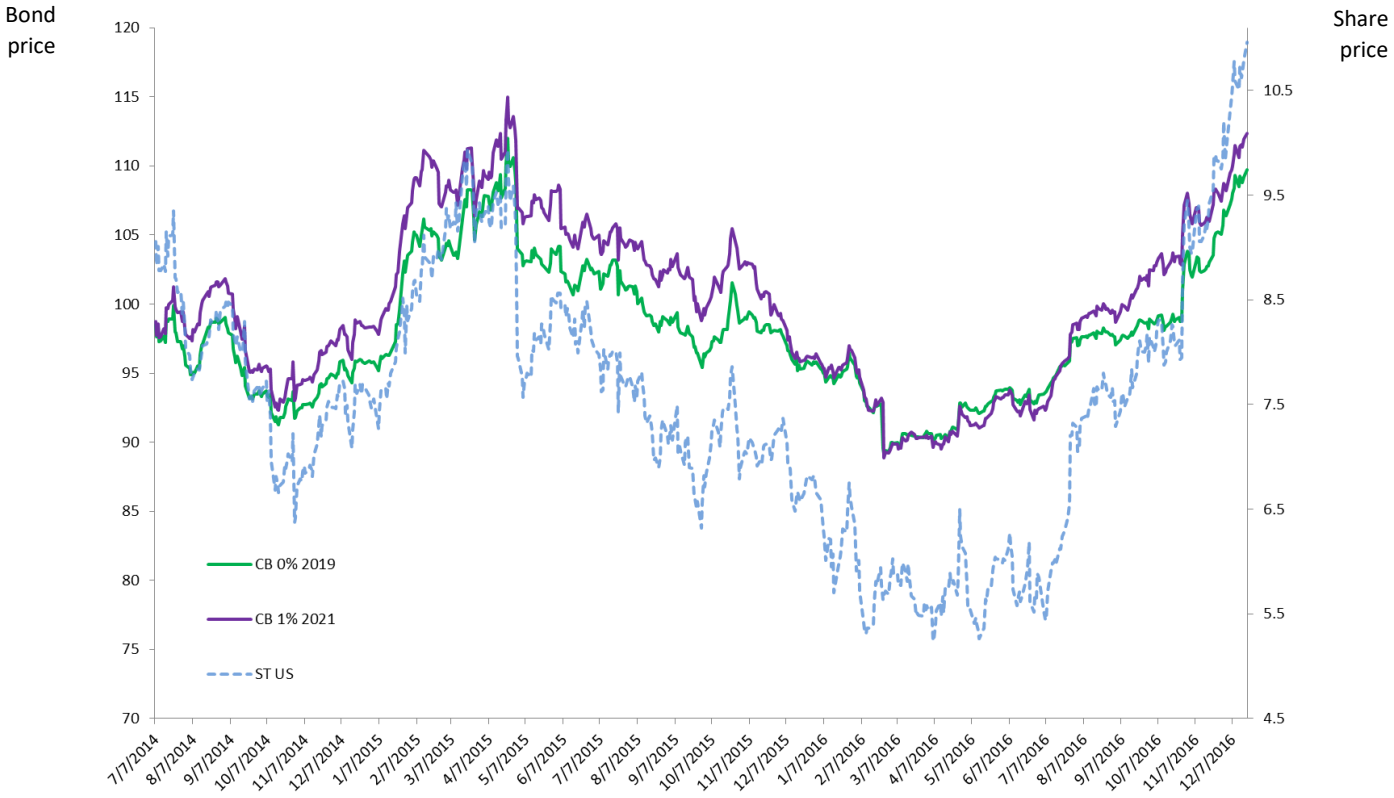
The combination of the Net Share Settlement Feature and 20 million Shares Buy Back has achieved a total offset of the dilution for ST shareholders.

The tranche 2021 is performing from issuance slightly better than the 2019 one because of the investors’ preference for a 1% interest versus a zero coupon bond.

The performance of the Convertible Bonds is tracking the underlying ST share price appreciation more closely than the increasing trend of US $ interest rates. As already highlighted in the Chapter 3.1, the more the stock price approaches to the Conversion Price, the more the Convertible Bond behaves like an equity instrument.

The Chart 31 below shows the strong correlation between the Convertible Bond and the underlying ST share prices.

Chart 31: Convertible Bonds performance from issuance



Source: Bloomberg as of Closing of 19/12/16

From July 2016 when the Company started improving significantly both financial results and business outlook, ST share price rallied approaching the Conversion price of the two Bonds. As already highlighted in the Chapter 3.1, the more the stock price approaches the Conversion Price, the more the Convertible Bond behaves like an equity instrument. A clear evidence is represented in the Chart 32, where the correlation between the share price and the two Bond prices has dramatically increased from July 2016.

Chart 32: Correlation between STM Share price and CB prices

Correlation Matrix up to 11 Jan 2017

STM Share Price NYSE	vs CB STM 0% 2019	vs CB STM 1% 202
from 01 Jan 2016	0.71	0.709
from 30 Jun 2016	0.851	0.873
from 30 Sep 2016	0.911	0.916

Source: Bloomberg

3.5 Conversion price adjustment

The Convertible Bonds 2019 and 2021 tranches were both issued with the feature of the symmetric Conversion price adjustment in case of either an increase or decrease in the dividend policy of dividend distribution. The Company issued the Convertible Bonds in 2014 when its dividend policy distribution was $0.10 per quarter. During 2016 the ST General Assembly voted to reduce the dividends to $0.06 per quarter for distribution starting from the second quarter of 2016.

The conditions for the adjustment are calculated at every quarterly distribution. A threshold of materiality of the adjustment has be reached to trigger the adjustment process.

Assuming the share price won't move significantly in future and that the dividend policy maintains a constant distribution of $0.06 per quarter, ST will slightly increase the conversion price of its Convertible Bonds every two quarters.

The first conversion price adjustment was triggered at the time of the third quarter 2016 dividend distribution.

The Conversion Price of the 2 Convertible Bonds has been adjusted from October 2016 as follows:

- 2019 Tranche – Zero Coupon $ 600 million – New Conversion Price $12.1275 from $11.9791 per Ordinary Share
- 2021 Tranche – 1% $ 400 million – New Conversion Price $12.2207 from $12.0712 per Ordinary Share

The adjustment represents a 1.24% increase in the Conversion Price and is incremental of the initial Conversion Premium of the two Convertible Bonds tranches of 30% and 31% respectively.

3.6 Conclusions

This case study shows how a large semiconductor multinational company like ST has taken its decision about the issuance of debt securities among a wide range of available alternatives.

What we can learn from this experience is that STMicroelectronics, in the frame of a traditional conservative financial policy even for a tech company, has opted to refinance some future expiring liabilities taking advantage of very favorable specific financial markets conditions for an investment grade issuer of convertible bonds.

The capability of the Company to issue complex equity linked securities with zero yield and zero dilution is an argument against the Proposition I of Modigliani and Miller. Indeed this example proves that the management can increase the value of the company finding specific clienteles for exotic securities.

The issuance of $ 1 billion of convertible bonds by ST Microelectronics has been innovative and successful because the Company has achieved zero cost and zero dilution. Indeed the 5 years tranche has been the first zero coupon and zero yield issuance in $ since 2007 from any Corporate issuer. Furthermore the dilution for the existing shareholders has been totally offset through the combination of Net Share Settlement and Shares Buy Back. The deal has been a win/win for both the Issuer and the Bondholders since ST has achieved exceptional terms and conditions while the investors are enjoying a Total return of 10.05% and 15.82% on the two tranches with the bonds trading respectively at 110.059 and 113.324 on January 11 2017.

The Company has achieved an all in weighted fixed cost of 0.40% on $ 1 billion of new debt significantly lowering its average cost of funding and managing to get a net interest income since the return on its liquidity investments was immediately higher than the cash cost of its financial liabilities. The Company also decided to invest one third of the proceeds in US Treasury Bonds with same maturity locking in a very significant interest differential (about 160 bps on the 5 years tranche and 110 bps on the 7 years tranche) against the cash cost of its new convertible debt .

Furthermore the Company issued debt securities at fixed rate in an environment of historically ultra-low but expected rising US interest rates. Indeed, since the issuance, the $ interest rates have significantly increased with a benign effect on the net interest income of ST thanks to the improved positive carry between the yield on liquidity and the cash cost of its debt.

STMicroelectronics has managed to issue its convertible bonds with a unique combination of features such as full settlement flexibility through any combination of cash and equity, symmetric dividend protection and two issuer’s soft calls for each tranche.

The execution of the 20 million shares buy-back program to neutralize dilution has achieved an average purchase price of $ 7.78, about 15% lower than the share price at issuance further improving the terms and conditions of the deal. Finally the issuance has been executed within an extremely tight opportunity window just before the start of the blackout period for ST.

While the main value for investors of a semiconductor company is driven by its innovation and capability to win designs with his customers and sell its chips and solutions with very high operating margins, the complexity of the financial management of a company like STMicroelectronics shows that the capital structure decisions and the optimal leverage level can either positively or negatively affect the value for the shareholders differently from the assumptions stated in the Proposition I by Modigliani and Miller.

We have also learned that, despite virtually no leverage, since ST does reports a net cash position of $ 0.5 billion, Rating Agencies are very demanding for technological companies which are more exposed to business cycles than other industries and also need to invest a significant percentage of their revenues in R&D and Capital Expenditure to maintain their competitive innovative edge.

In a case like the one of STMicroelectronics, a very aggressive leverage that would be positive for the tax shield cannot be pursued because of the potential risk of distress in case of adverse business cycles. Indeed, despite the recent wave of consolidation in the semiconductor industry, with the acquisition of Broadcom from Avago and NXP from Qualcomm just to mention the major ones, the gross leverage remains modest in comparison with other industries with more predictable and less volatile business cycles and cash flows.

The semiconductor industry has learned the lesson of excessive leverage when in 2006 private equity firms overleveraged NXP and Freescale. Both Companies risked the default on their debt obligations when the business cycle turned very negative in 2009 after the sub- prime and Lehman Brothers financial crisis.

What it can also be observed in the case study is the constraint for ST to a higher leverage because of the lower operating margin than its competitors.

The financial management of ST has been quite conservative during the last few years due to the restructuring following the dissolution of an important customer like Nokia,

which accounted for 20% of ST total revenues and the heavy losses incurred in the Joint Venture with Ericsson which had to be finally put in liquidation.

Furthermore the volatility of the foreign exchange rate has been another constraint to higher leverage since the Company has got about 85% of revenues in $ but the vast majority of costs in Euro and other currencies such as the Singapore $ and other Asian currencies because of ST significant front end and back end manufacturing operations in Europe and Asia.

Indeed we have seen in the second Chapter that most of the financial debt of ST is in $ in order to avoid creating a mismatch and an additional foreign exchange risk versus its revenues.

Finally we have experienced how different the financial management can be from industry to industry both in term of optimal leverage and range of alternative debt instruments.

In the case of ST the high volatility of its share price has allowed the Company to issue convertible bonds with zero yield and a conversion premium of 30% higher than the stock price at issuance. Nevertheless the bondholders are enjoying very positive total returns on both tranches thanks to the improved performances of the company which have caused a share price appreciation well above $ 11, very close to the conversion price.

The effect of the potential conversion from the bondholders can be well managed by the Company since ST may decide either to repay the $ 1 billion principal in cash delivering only the shares acquired with the buy back at a significant lower price or decide to issue about 80 million of new shares to redeem the debt.

In the first case the capital structure would remain unchanged and likely the Company may decide to refinance in advance this redemption whereas in the second case the capital structure would be significantly strengthened with an increase of equity and net cash position and a decrease of $ 1 billion of debt.

The decision will eventually depend on the willingness of the current controlling shareholders to accept some dilution in order to raise additional resources to be deployed in future merger and acquisitions opportunities to strengthen its leadership position in the global semiconductor market.

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