An Asset Cash Flow Method For Bank Valuation

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Abstract

In this paper we frame the effect of bank debt in the form of liquid financial claim on bank value and on cost of capital when bank assets are risky. From the MM (1958) arbitrage proof we derive a bank specific valuation approach that separates the asset cash flow value and the value of debt benefits (tax shield and liquidity premium), both in a steady state and in a steady growth scenario. In respect of the most common DCF Equity side bank valuation schemes, the model avoids the redetermination of the discount rate when the implicit debt-to-value ratio changes through the forecast period.

Keywords: *bank valuation, capital structure, cost of capital, liquidity premium, taxes*.

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1. Introduction

Banks represent a peculiar case in valuation because they create value both from asset and liabilities side due to the liquid-claim production (De Angelo and Stulz 2015). Such peculiar and unique feature of banking has several important side effects on cost of capital and total value (Hanson et al. 2011; Kashyap et al. 2010).

Although the effect of leverage on value has been widely acknowledged in banking literature due to the liquid financial claim production (among others Diamond and Dybvig 1983, Diamond and Rajan 2001; Gorton 2010; Gorton and Pennacchi 1990, Holmstrom and Tirole 2011), from a corporate finance perspective there has not still made enough effort in formalizing a bank-specific valuation model able to highlight the implications of bank indebtedness on cost of capital and enterprise value.

In this paper, we try to close this gap proposing a new theoretical framework for a bank-specific adjusted present value model (APV) (Myers 1974), which enable to explain how asset and debt contribute to value generation through their cash flows.

The most accredited view in banks valuation follows an equity-side approach, while asset-side models are the most used metric in case of industrial firms (Barker 1999; Imam et al. 2008). This is because the value created through the liquid-claims entails relevant criticalities in terms of operating cash flows and weighted average cost of capital estimation (Copeland et al. 2000, Damodaran 2013, Massari et al. 2014). The model we propose aims at overcoming such issues moving toward an asset-side perspective in order to explaining the effect of debt on total value.

In the asset side approach, firm value is obtained using two alternatives: (a) discounting free cash flow from operations at weighted average cost of capital (the aggregate model); or (b) discounting free cash flow from operations at unlevered cost of equity adding, separately, the present value of tax savings (the disaggregate model) like in the APV approach of Myers (1974) or in the Capital cash flow method (CCF) of Ruback (2002). The disaggregate model exploits the well-known debt value relation proposed in their seminal works by Modigliani and Miller (1958, 1963, hereafter MM) and enables to clearly split the effect of investing and financing decisions on value. In case of banks, given to the production of liquid-claims and the associated value generation, a disaggregate model can be a useful solution to highlighting debt advantages and cost of capital implications.

However, the main critical issue of the disaggregate model to banks is the applicability of MM theories. First, the extension of the MM propositions to financial intermediaries is questioned due to the incompatibility of the assumptions underlying the MM basic framework in relation to the role of financial intermediaries in reducing information asymmetries. Second, more technically, a formal restatement of the MM first and second propositions can be difficult because of the separation of operating from financial management both in terms of cash flows and cost of capital.

In order to overcome these issues, we firstly restate the MM propositions for banking firms exploiting the segmented markets model (Merton 1990; DeAngelo and Stulz 2015) that allows the existence of banks in a perfect and complete financial market. Then, using a MM (1958) static partial equilibrium model as a reference, we separate the contribution of assets from liabilities on bank enterprise value in line with the original development of the disaggregate models for non financial firms. In addition, we provide a bank valuation scheme and the related cost of capital implications both in a steady state and a steady growth framework.

The model proposed show directly and explicitly the determinants of bank value in respect of the other bank valuation models. Mostly, like in the case of highly levered transactions in which the capital structure change over time, the adoption of the disaggregate asset side model to banks avoid the implementative problems typical of DCF equity side models and asset side aggregate models. In fact the higher amount of debt in banking and the frequently change in leverage ratio due to the change in capital requirements, would require a constant redetermination of cost of equity and weighted average cost of capital.

The paper is organized as follow: the next section frame the theoretical model; the third section presents the valuation scheme in a steady state and in a steady growth scenario, providing the relative cost of capital implications; section fourth is devoted to highlight the implementative problem when classic equity side models are used; fifth section discuss the use of the appropriate discount rate for debt benefits and sixth section concludes the paper.

2. Capital structure and bank total value

The effect of leverage on firm value and cost of equity are usually analysed in the light of MM propositions. If the leverage irrelevance principle were valid for banking firms as predicted by the first proposition, a variation of financial leverage would imply a proportional variation of cost of equity, maintaining stable the overall cost of funding. The shared view of the literature is that MM theorems cannot be applied to banks in perfect and complete financial markets, because the absence of information asymmetries makes unnecessary the presence of financial intermediaries (Mehran and Thakor 2011). De Angelo and Stulz (2015) offer a viable solution for such alleged incompatibility introducing a segmented-markets model (Merton 1990) which assumes two financial markets with different level of information availability: a first perfect and complete financial market and a second financial market with frictions. In their model, banks act in the first market and extend loans to agents that operate in the second financial market. Thus banks maintain their role of reducing information asymmetries between agents under the MM assumptions.

With regard of investigating the effect of financial structure on value, MM requires the clear split between operating and financial cash flows. But such cash flows break-up is not doable in case of banks, because financial management is the operating management of a financial intermediary. In order to overcome this problem, we reconsider the cash flow generation dividing those coming from asset from those coming from debt. In asset cash flows we take into account not only of the positive components arising from loans and securities, but also of the negative components related to intermediating cost which depend on the bank scale and size (De Angelo and Stulz 2015).

Combining the segmented financial market assumption and the distinction between asset and debt cash flows, we exploit a static partial equilibrium model from which it is possible to analyse the effect of leverage on bank value.

2.1 The static partial equilibrium model for banks

We consider two banks with the same class of risk and the same operating expected return (X) given by the net profit of the intermediation activity, before the deduction of financial expenses paid on debt. Both banks operate in the first perfect and complete financial market and intermediate to agents that are part of the second imperfect and incomplete financial market. The first bank (1) is financed only by equity (S_1), while the second bank (2) has a financial structure composed by equity (S_2) and safe debts in the form of deposits (D_2). Bank 2 gains a liquid financial claim premium (p), equal to the difference between the perfect and complete market interest rate (r_f) (that is the risk free) and the liquid financial claim interest rate (r_l). Precisely, the liquidity premium is reached paying debt at r_l rather then r_f.

The existence of two different interest rates in the frictionless market is justified by the presence of the intermediation costs: they eliminate arbitrage across the two markets and, consequently, make possible a liquidity financial claim interest rate lower than risk free rate. On this basis, according to the seminal work of MM (1958), we proof that for an agent operating in a first perfect and complete financial market, the “homemade leverage” and “mixed portfolio” strategies converge to the same result of a levered equity portfolio and unlevered equity portfolio respectively.

2.2“Homemade leverage” strategy

If an investor holds a fraction α of bank 2 equity, its return Y_2 would be equal to:

$$Y_2 = \alpha(X - r_l D_2) \quad (1)$$

The investor could replicate the same capital structure of bank 2 selling his stocks, borrowing on his own credit an amount of debt equal to αD_2 and purchasing on the market an amount of equity of bank 1 equal to $\alpha(S_2 + D_2)$. Accordingly, he would acquire a percentage of equity equal to $\alpha(S_2 + D_2)/S_1$. The return Y_1 for the so called "homemade leverage" strategy would be equal to:

$$Y_1 = \alpha \frac{V_2}{V_1} X - r_f \alpha D_2 \quad (2)$$

where $S_2 + D_2$ is equal to V_2 and S_1 is equal to V_1, while r_f is the interest rate paid on debt by the investor himself in a perfect and complete market. The investor would have the incentive to sell his stocks of bank 2 and purchase stocks of bank 1 only when $Y_1 > Y_2$ and until the increase in bank 1 equity and the decrease in bank 2 equity make equal the return on bank 2 with the return on "homemade leverage" strategy ($Y_1 = Y_2$):

$$\alpha(X - r_l D_2) = \alpha \frac{V_2}{V_1} X - r_f \alpha D_2 \quad (3)$$

2.3 "Mixed portfolio" strategy

If the investor holds a fraction α of bank 1 (unlevered) equity, its return Y_1 would be equal to:

$$Y_1 = \alpha X \quad (4)$$

The investor can switch his all equity unlevered portfolio in a mixed portfolio (made of an equity and debt mix) selling his stocks and acquiring a proportional amount of equity of bank 2 equal to $\frac{V_1\alpha}{V_2}E_2$ and an amount of debt of $\frac{V_1\alpha}{V_2}D_2$. As long as the investor acts in a perfect and complete financial market, he would be able to achieve an interest rate on debt equal to the risk free rate, rather than the lower interest rate obtained by agents of the imperfect and incomplete financial market. Therefore, the total return on the mixed portfolio (on equity and debt – Y_2) is:

$$Y_2 = \frac{V_1\alpha}{V_2}(X - r_l D_2) + r_f \frac{V_1\alpha}{V_2} D_2 \ (5)$$

The first term of (5) represents the yield on equity and the second term the yield on debt. The investor would have the incentive to sell his stocks in bank 1 and acquire stocks of bank 2 if $Y_2 > Y_1$ and until the increase of bank 2 equity and the decrease of bank 1 equity makes equal the return on bank 1 with the return on mixed portfolio strategy ($Y_1 = Y_2$):

$$\alpha X = \frac{V_1\alpha}{V_2}(X - r_l D_2) + r_f \frac{V_1\alpha}{V_2} D_2 \ (6)$$

Table 1

Different investor's strategies: summary

This table resume the pay-offs of investors' strategies. Firstly we reported the cost and pay-off associated with buying levered bank stocks and a "homemade leverage" strategy. Secondly, we reported the cost and pay-off of buying unlevered bank stocks and a "mixed portfolio" strategy. Buying levered bank stocks or buying a mixed portfolio strategy gives a premium to the investor equal to the difference between the market interest rate and interest rate on deposits. The difference in the interest rates makes higher the value of levered compared to the unlevered bank.

Buy levered bank vs "homemade leverage" strategy

Strategies	Today you pay	Pay out in each period
Strategy 1: Buy levered bank's equity	E (=V levered-D)	Bank cash flow - D rl
Strategy 2: Buy unlevered bank's equity	V unlevered	Bank cash flow
and borrow a loan	- D	-D rf
	V levered - V unlevered	D (rf - rl)

Buy unlevered bank vs "mixed portfolio" strategy

Strategies	Today you pay	Pay out in each period
Strategy 1: Buy unlevered bank's equity	V unlevered	Bank cash flow
Strategy 2: Buy levered bank's equity	V unlevered	Bank cash flow - D rl
and buy bank's debt	- D	-D rf
	V unlevered - V levered	-D (rf - rl)

2.4 Leverage effect on bank value

Expressing in terms of V_2, both (3) and (6) leads to (7) in equilibrium:

$$V_2 = \frac{V_1}{X} D_2 (r_f - r_l) + V_1 \ (7)$$

We can now define V_1/X as the factor of proportionality $1/\rho_1$ or the inverse of expected rate of return, that is the cost of equity for the unlevered bank associated to a specific class of risk. Hence, (7) is formally the MM first proposition when deposits are priced considering a liquidity premium $(r_f - r_l)$. Accordingly, more a bank levers up, higher is the bank firm value. But if the bank does not obtain a liquidity premium, the interest rate on debt is that of market because $(r_f = r_l)$. As a consequence, the enterprise value of unlevered bank (1) and levered bank (2) are the same and the MM leverage irrelevance principle holds true. On the contrary, if bank 2 issues debt with liquidity premium compared to the market rate $(r_f - r_l = p > 0)$, then the enterprise value of the levered bank will be higher than the unlevered bank ($V_2 > V_1$). In this case, debt will be far the preferred source of funding and consequently the leverage irrelevance principle does not hold true anymore.

If (7) is re-expressed as a function of the unlevered cost of capital, the enterprise value of the bank would be equal to:

$$V_2 = D_2 \frac{(r_f - r_l)}{\rho_1} + \frac{X}{\rho_1} \quad (8)$$

The first term of the equation is the Present Value of Liquidity Premium (PVLP), while the second term is the bank's asset cash flow discounted at the cost of capital of the unlevered bank in a steady state framework.

In a perfect and complete financial market a bank can transform their risky assets in riskless assets through a hedging policy. On this basis, our model would converge to the DeAngelo and Stulz's in which free cash flow to equity (and asset's cash flow as a consequence) are discounted at risk free rate. However the bank's firm value does not only depend on its assets value, but also on the value created on other financial services such as investment banking and others. The risk related to such typology of business cannot be totally eliminated through hedging strategies and therefore the discount rate of these cash flows should be higher than the risk free rate.

Thus, in a similar manner of the MM application in non-financial firms, asset cash flows should be discounted at a $\rho_1 > r_f$. The presence of risky asset implies lower capacity of issuing safe debt. In facts, banks could lever up without loosing the liquidity premium until the debt is equal to the value of perfectly hedged assets and, as a consequence, less than 100% of its enterprise value. The same conclusion is reached by DeAngelo and Stulz (2015) when the only imperfect hedging strategy is possible, making capital requirements useful to cover unexpected losses.

3. An asset cash flow method for bank valuation

The bank valuation scheme proposed in the previous section separates the unlevered bank value from the benefits arising from debt, in line with an asset side disaggregate valuation model used for non-financial firms. Precisely, in the case of industrial firms, the asset side disaggregate model determines the enterprise value as the sum between the unlevered firm and debt's tax benefits value. In the case of banks, as we previously discussed, indebtedness generates value not only through the deductibility of interest expenses, but from the liquidity premium on deposits as well.

In this section we present our bank valuation model which takes into account both the tax and liquidity premium benefits in two configurations: the steady state and the steady growth scenario. In each of them, we make diverse assumptions on the discount rate of debt benefits. The approaches we introduce entail different implications in terms of weighted average cost of capital and cost of equity.

3.1 The steady state valuation

According to MM propositions, we can choose to discount fiscal and liquidity premium benefits at unlevered cost of equity (MM 1958), or at the cost of debt (MM 1963). In the first case, both the debt benefits in the form of liquidity premium and tax-shields are discounted at the cost of capital for unlevered bank. Thus (8) becomes:

$$V_2 = PVLP + PVTS + V_1 = D_2 \frac{(r_f - r_l)}{\rho_1} + D_2 \tau \frac{r_l}{\rho_1} + \frac{X^\tau}{\rho_1} \quad (10)$$

where $PVTS$ is the Present Value of Tax Shield. More synthetically the (10) can be written as:

$$V_2 = PVTB + V_1 = D_2 \frac{\left[r_f - r_l(1-\tau)\right]}{\rho_1} + \frac{X^\tau}{\rho_1} \ (11)$$

where τ is the tax rate and X^τ is the net bank's assets cash flow after interests expenses and. The first term on the right side of the equation stands for the Present Value of Total Benefits (PVTB) on debt while the second term is the unlevered bank value.

As one can note, the valuation approach introduced provides a useful separated view of bank value enabling to understand the contribution of asset, liquidity premium and tax-shields to the enterprise value of the bank. However, as in the case of non-financial firms, such valuation model should be equivalent to the asset side aggregate model in which free cash-flows are discounted at weighted average cost of capital (ρ_2) whereby debt benefits are included in the discount rate:

$$V_2 = \frac{X^\tau}{\rho_2} \ (12)$$

It has been demonstrated that the aggregate model leads to the same result of the disaggregate model when benefits from tax-shields are discounted at the unlevered cost of equity (Ruback 2002). Therefore adapting the traditional relation between weighted average cost of capital and unlevered cost of equity to the case of banking firms, the relation between ρ_2 and ρ_1 can be written as:

$$\rho_2 = \rho_1 - \frac{D_2}{V_2}\left[r_f - r_l(1-\tau)\right] \ (13)$$

Other things remaining equal, ρ_2 decreases when leverage increases more than proportionally according to the size of liquidity premium and taxes effect (Hanson et al. 2011; Kashyap et al. 2010).

Our model should be consistent also considering an equity side model. In this case the value of a bank can be measured as:

$$S_2 = \frac{Y_2}{i_2} \quad (14)$$

where i_2 is the cost of equity. Combining (13) with the traditional weighted average cost of capital formula (15):

$$\rho_2 = i_2 \frac{E_2}{V_2} + r_l(1 - \tau)\frac{D_2}{V_2} \quad (15)$$

we obtain the cost of equity i_2 consistent with the valuation approach proposed:

$$i_2 = \rho_1 + \left(\rho_1 - r_f\right)\frac{D_2}{S_2} \quad (16)$$

Equation (16) is the second proposition of MM. As in case of non-financial firms, when bank debt benefits are discounted using the cost of unlevered firm, the cost of equity is directly not dependent from tax rate and liquidity premium.

In the case of MM (1963) and in line with the original adjusted present value approach of Myers (1974), the debt benefits are both discounted at risk free rate (that is the cost of debt) and therefore equation (10) becomes:

$$V_2 = PVLP + PVTS + V_1 = D_2 \frac{(r_f - r_l)}{r_f} + D_2 \tau \frac{r_l}{r_f} + \frac{X^\tau}{\rho_1} \quad (17)$$

and the synthetic version of the valuation model (equation 11) becomes:

$$V_2 = PVTB + V_1 = D_2 \left[\frac{r_f - r_l(1-\tau)}{r_f}\right] + \frac{X^\tau}{\rho_1} (18)$$

The weighted average cost of capital and the cost of equity consistent with the use of cost of debt to discount tax benefits and liquidity premium are respectively:

$$\rho_2 = \rho_1 \left[1 - \frac{D_2}{V_2} \frac{r_f - r_l(1-\tau)}{r_f}\right] \quad (19)$$

$$i_2 = \rho_1 + (\rho_1 - r_f)(1-\tau) \frac{r_l}{r_f} \frac{D_2}{S_2} \quad (20)$$

where equation (20) is the reinterpretation of the MM with taxes integrated with the liquidity premium. All other things remaining equal, larger is the difference between the risk free rate and the pricing of deposits, flatter is the effect of leverage on cost of equity.

3.2 The steady growth valuation model

Also in the case of growth we can assess banks' debt benefits discounting either at the unlevered cost of equity (more recently, Dempsey 2013) or at the cost of debt (Massari et al. 2007).

Therefore considering a constant growth rate both for asset and debt, following Dempsey (2013), (10) becomes:

$$V_2 = PVLP + PVTS + V_1 = D_2 \frac{(r_f - r_l)}{\rho_1 - g} + D_2 \tau \frac{r_l}{\rho_1 - g} + \frac{X^\tau}{\rho_1 - g} \quad (21)$$

and (11) becomes:

$$V_2 = PVTB + V_1 = D_2 \frac{[r_f - r_l(1 - \tau)]}{\rho_1 - g} + \frac{X^\tau}{\rho_1 - g} \quad (22)$$

Also in the steady growth scenario the model must be consistent both with the aggregate model and with the equity side approach. In the case of the aggregate model, bank value is equal to:

$$V_2 = \frac{X^\tau}{\rho_2 - g} \quad (23)$$

The weighted average cost of capital making equal the value obtained through (22) with the one obtained through (23) is reached using the same formula of the steady state framework (Miles and Ezzell 1980; Dempsey 2013):

$$\rho_2 = \rho_1 - \frac{D_2}{V_2}[r_f - r_l(1 - \tau)] \quad (24)$$

Thus when debt benefits are discounted at unlevered cost of capital, growth does not affect the weighted average cost of capital.

Also for the equity-side approach, we can assess the value of equity discounting the expected free cash flow to equity at the difference between the cost of equity and growth rate:

$$S_2 = \frac{Y_2}{i_2 - g} \quad (25)$$

As one can note, the cost of equity in a growing scenario is calculated as MM do in their second proposition without taxes:

$$i_2 = \rho_1 + (\rho_1 - r_f)\frac{D_2}{S_2} \quad (26)$$

Conversely, following Massari et al. (2007), our model becomes:

$$V_2 = D_2 \frac{[r_f - r_l(1-\tau)]}{r_f - g} + \frac{X^\tau}{\rho_1 - g} \quad (27)$$

Accordingly, the weighted average cost of capital (19) and cost of equity (20) must be restated for the growth scenario. Combining (27) with (23), we find the relation between weighted average cost of capital and unlevered cost of capital:

$$\rho_2 = \rho_1 - \frac{\rho_1 - g}{r_f - g}\,[r_f - r_l(1-\tau)]\frac{D_2}{V_2} \quad (28)$$

while combining (28) with (14), we restate the cost of equity as:

$$i_2 = \rho_1 + (\rho_1 - r_f)\frac{D_2}{S_2}\left[\frac{r_l(1-\tau) - g}{r_f - g}\right] \quad (29)$$

Differently from the previous model version, the weighted average cost of capital and the cost of equity are affected by taxes, liquidity premium and growth rate.

4. The discount rate in the equity side models and in the aggregate asset side model: an implementative problem

In the previous section we show that equity side model, from which other equity side DCF bank valuation model are derived, provide the same valuation results of the asset side models when the MM second proposition is used like linking point. However the equity side models common used in practice and the aggregate model suffer of an implementative problem.

Due to the effect of debt on cost of equity, the discount rate used to actualized dividends or cash flow to equity should be restated when leverage change, even if this reference is often maintained fixed in practice. As a consequence, as in the case of industrial firms, the equity side DCF method presents the problem relate to the constant redetermination of the discount rate if the leverage change over time (Ruback 2002). For example, when the DDM excess capital is applied, and the free capital is virtually distributed in the first phase of the analytic forecast period, the analyst should restate the cost of equity in the light of the reduction of equity capital; and this should occur also if more change in capital requirements is expected in the analytic forecast period. And this criticism is evident also for the aggregate asset side model in which the change in capital structure affects weighted average cost of capital trough the taxes and the liquidity premium effects.

The asset side disaggregate model proposed, requiring a separate valuation of debt benefits, can be use also in an analytic valuation when the debt to asset value is not stable, without restate the discount rate.

5. Choosing the appropriate discount rate for debt benefits

The stand-alone valuation of debt benefits requires to choose the appropriate discount rate in the actualization of tax shields and liquidity premium. In the case of the fiscal benefits arise on the non – financial firms' debt, the literature recommend the use of cost of debt in the steady state hypotheses (MM 1963; Myers 1974) and, conversely, the unlevered cost of capital in a steady growth hypotheses (Dempsey 2013). In the first case, when debt is fixed forever, MM (1963) justified their correction toward the cost of debt in respect of the unlevered cost of capital underlying the different risk profile between firms operating cash flow and tax shield cash flow: the former is characterized by an uncertain streams while the latter is related to a certainty debt. In the second case, when the dynamic of debt is in line with that of the free cash flow from operations (and with the same expected growth rate), the literature shares to discount tax benefits at the unlevered cost of capital (Cooper and Nyborg 2006; Dempsey 2013; Harris and Pringle 1985; Miles and Ezzell 1980; Ruback 2002).

In the case of banks, although there are no explicit references to a stand alone valuation of debt benefits, the empirical models used to investigate the effect of capital requirements on systematic risk implicitly take the cost of unlevered capital like discount rate for debt benefits (Baker and Wurgler 2013, Miles et al 2013). This is because it is assumed that the debt cash flow advantages presents the same risk of operating assets. However, like in the industrial firms, the choice depend from the technical assumption on the debt policy. Whether we assume to maintain stable the debt value long the forecast period, the discount rate should be the cost of debt while assuming the stability of debt-to-value rate in the case of steady growth, the discount rate should be the same of asset cash flows. In the real world an intermediate situation could occur for banks: a first part of debt constitute the stable funding (e.g. a large part of core deposits) and a second part of debt growth in the same quantity of assets (e.g. a minor part of core deposits, bond and medium log term debt). Thus according with Ruback (2002) the model could become:

$$V_2 = D_{2,fixed}\frac{\left[r_f - r_{l,fixed}(1-\tau)\right]}{r_f} + D_{2,growth}\frac{\left[r_f - r_{l,growth}(1-\tau)\right]}{\rho_1 - g} + \frac{X^\tau}{\rho_1 - g} \quad (30)$$

where $D_{2,fixed}$ is the stable part of debt, $D_{2,growth}$ is the growing part of debt ($D_{2,fixed}+D_{2,growth} = D_2$), $r_{l,fixed}$ is the interest rate on stable part of debt (average between the interest rate on the stable part of deposits and interest rate on the other stable part of debt), $r_{l,growth}$ is the interest rate on the growing part of debt (average between the interest rate on the growing part of deposits and interest rate on the other growing part of debt). As one can note (30) is useful when other kind of debt different from deposits are introduced in the model. As a consequence the liquidity premium is considered in a wide perspective adding to deposits the other kind of bank debt.

6. Conclusions

Are MM theorems extendible to banking firms? Several contributions analysed the issue both in conceptual (among others Miller 1995; Admati and Hellwig 2013) and in empirical way (Baker and Wurgler; Kashyap et al 2012; Miles et al. 2013).

In this paper we try to remain consistent with the original assumption of the MM propositions exploiting the segmented markets model as in the De Angelo and Stulz (2015) work but differing in three aspects. First, using the original MM arbitrage proof, we focus on the enterprise value of a bank showing where value is generated splitting asset value form debt benefits value, rather than an equity view. Second, we consider the presence of risky assets in banks activity. Third, we derive the cost of equity and weighted average cost of capital implications when liquidity premium and taxes come into play.

On this basis we conclude that: 1) The irrelevance principle is not valid for banks if the they gain a liquidity premium on deposits; 2) Similarly to the MM first proposition with taxes, the total bank value is the sum between the stand alone asset value and debt advantages; 3) When debt and profits are fixed, higher is the liquidity premium, flatter is the relation between leverage and cost of equity.

Those conclusions lay the foundation for a novel bank specific valuation method based on asset and debt cash flows in which the bank total value is influenced by the present value of tax savings and the present value of liquidity premium, similarly to the adjusted present value of Myers (1974) and the capital cash flows of Ruback (2002) applied in the valuation of industrial firms. We highlight the application of the model in the steady state and steady growth scenario, providing the reconciliation equation that makes equal the value of the method with the aggregate asset side and equity DCF methods.

In the concrete application the model avoids the redetermination of the discount rate in DCF equity side methods when the implicit debt-to-value ratio changes through the forecast period and provide a more wide view on where the value in banking is created. However, a comparison between the asset cash flow method and other valuation models in the spirit of Kaplan and Ruback (1995) might be useful to determine the accuracy of an asset disaggregate model in respect of aggregate WACC model, DCF equity side models and equity market multiples.

Appendix - Systematic risk and leverage: determining the cost of unlevered bank

A separate determination of bank unlevered value requires the use of unlevered cost of equity (ρ_1) to discount the asset cash flows. The cost of equity for unlevered firm is generally unobservable due to the presence of levered firms in the financial market. Assuming a perfectly diversified investor, we can express ρ_1 through the CAPM relation:

$$\rho_1 = r_f + \beta_U\left(r_m - r_f\right) \ (A1)$$

Where β_U is the beta of unlevered bank while r_m is the return of market portfolio. In the light of CAPM the problem shift to the calculation of unlevered beta.

Hamada (1972) introduced a model to determine unlevered (or asset) beta combining MM second proposition and CAPM. Assuming that the beta of debt is zero (in line with prior studies that analysed the effect of leverage on bank overall cost of capital) and debt benefits are discounted at unlevered cost of capital, we can establish the relation between levered and unlevered beta as:

$$\beta_E = \beta_U\left(1 + \frac{D}{E}\right) \ (A2)$$

On the contrary, when debt is fixed and debt benefits are discounted at cost of debt (risk free rate), equation (30) becomes:

$$\beta_E = \beta_U\left[1 + (1 - \tau)\frac{r_l}{r_f}\frac{D}{E}\right] \ (A3)$$

Whether debt benefits are discounted at cost of unlevered capital, the Hamada equation is the same of the non – financial firms case. Differently, equity betas would be affected by taxes and by the difference between free risk rate and the cost of core deposits. Inverting two relations we can reach unlevered beta in the two different basic assumptions, respectively:

$$\beta_U = \frac{\beta_E}{\left(1+\frac{D}{E}\right)} \ (A4)$$

$$\beta_U = \frac{\beta_E}{\left[1+(1-\tau)\frac{r_l}{r_f}\frac{D}{E}\right]} \ (A5)$$

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