Introduction to Synthetic and Structured Assets

Financial activities have been a part of the global economic framework for centuries. Lending, borrowing, speculating, investing, and hedging, for instance, have been employed for years by a broad range of institutions in order to achieve specific financial goals. Not surprisingly, as forces of deregulation, technology, and capital mobility have taken firmer root in the landscape of the late 20th and early 21st centuries, the financial marketplace has evolved, becoming increasingly useful, efficient, and sophisticated. It is now common for institutions, which once relied on basic capital-raising and investment instruments, to turn to a range of highly customized, though eminently practical, assets and liabilities in order to achieve desired goals. Our aim in this text is to examine many of these customized instruments, demonstrate how they have developed and evolved, and consider how they function mechanically, and in practice.

Our target sector can be classified in a number of ways. For our purposes, we consider the markets and products in two broad forms: structured assets and synthetic assets.

- **Structured assets.** We define the class of structured assets to include instruments that are created, decomposed, or restructured in some fashion in order to redirect or alter underlying cash flows. This may be accomplished by altering the properties of physical assets, such as bonds or equities, through the use of special purpose entities/trusts and/or through the inclusion of one or more derivative contracts, which are off-balance sheet contracts that derive their value from some underlying reference.

- **Synthetic assets.** We define the class of synthetic assets to include instruments that are created exclusively out of one or more derivatives. The package of contracts generates cash flows that correspond with specific end-user requirements.

There are instances when both classes of assets can be used to achieve the same end results. Consider, for instance, that a pool of secondary mortgages can be combined through a trust or special purpose entity (SPE) to create a mortgage-backed security (i.e. a structured asset), while a mortgage swap or total return swap can be created to mimic the flows of the same pool of mortgage-backed securities (i.e. a synthetic asset). In some instances, it may be advantageous to create the asset in structured form, while in other situations it may be beneficial to do so synthetically. These broad classifications serve us well in arranging the discussion and analysis which follows, by allowing us to consider separately those instruments that can be decomposed and restructured through a redirection of cash flows, and those that can be created or replicated using off balance-sheet contracts.

We consider in this introductory chapter key items related to the historical development of synthetic and structured assets, and key drivers that have fuelled market expansion over the past years. We then consider general issues related to new product design, and the essential characteristics that are required for success. In order to frame the material properly, we also provide an outline of the structure of chapters that follow. These topics provide an appropriate macro context for the more detailed market and product material that follows in the remainder of the book.
1.1 DEVELOPMENT OF STRUCTURED AND SYNTHETIC ASSETS

Although the broad class of synthetic and structured assets has gained increasing attention and use since the 1990s, aspects of the market date back many decades. Indeed, some of the most elemental and popular instruments of the financial markets are structured assets dating back to the 19th century. Consider, for instance, that the convertible bond, which is a package of a fixed-income security and an investor equity option to convert the bond into the stock of the issuer, was first launched in the mid-1800s. The first commodity-linked bond, with redemption tied to the price of cotton (i.e. a bond and an investor cotton option), dates back to the same era. Mutual funds, which essentially are single shares of stock representing an interest in a broader portfolio of assets, were developed in the late 1880s and early 1900s and popularized in the 1960s, and have evolved and expanded since that time. Even callable bonds (e.g. a bond and an issuer call option) and puttable bonds (e.g. a bond and an investor put option), have been in existence for several decades, and are now mainstays of the marketplace.

Though the synthetic and structured market traces its roots back a minimum of several decades, it is clear that the greatest amount of financial innovation and growth has occurred in more recent times. Key factors such as derivative valuation methods, technology, legal structuring, market liquidity, cross-border capital flows, and financial creativity have led to the development of increasingly customized and sophisticated assets. By reacting to forces that simply did not exist during earlier times, intermediaries have been able to expand their ability to meet the needs of end-users, including issuers and investors.

For instance, prior to the advent of option valuation models (beginning with seminal work by Black, Scholes, and Merton in the early 1970s), there was little in the way of comprehensive options dealing; since options are a core constituent of many of the instruments we consider below, many new products simply could not be structured.

Similarly, the introduction of more powerful (and inexpensive) computing capacity, starting in the 1990s and accelerating into the new millennium, has led to the creation of increasingly complex products that require intensive simulation-based pricing routines. Networking and communications have also promoted the concept of electronic trading platforms and electronic communication networks, both of which promise to continue the trend towards online OTC product trading – including trading of structured and synthetic assets.

Clarification of the legal environment has also proven significant in the development of the sector. Creation and use of standardized legal documentation (e.g. bank loan agreements, trading confirmations, International Swaps and Derivatives Association (ISDA) Master Agreements) has made it easier for parties to a transaction to agree binding terms and conditions, and to settle disputes or disagreements efficiently. Legal agreement on the right to net credit exposures in the event of bankruptcy has made it possible for participants to manage their risks (and risk capital) more accurately. Legal development of vehicles such as SPEs and trusts, often in tax-friendly and legally secure jurisdictions, has likewise prompted new product development. Though legal uniformity does not exist in all countries or regions, it is certainly prevalent in most of the world’s primary financial dealing jurisdictions (e.g. North America, Europe, Japan).

Market liquidity has also been an important factor in the development of various instruments. As many financial assets and contracts have developed a core base of interest among an increasingly broad group of users, liquidity has grown in tandem. This has been especially important for basic financial assets that are used to construct structured and synthetic contracts.
We shall note in Chapter 2 that the fundamental “building blocks” of the sector are all liquid instruments that benefit from active two-way flows. Without such market liquidity, it would be difficult to create, in an economically rational way, the products we discuss in this text. It is worth noting, of course, that the synthetic and structured assets that result from the financial engineering process do not feature the same degree of market liquidity as the underlying assets. Most are far less liquid than the building blocks used in the construction process – a fact that is hardly surprising, since many of the resulting instruments are intended to meet specific end-user needs.¹

The financial creativity of intermediaries has been a catalyst in structured and synthetic asset development. Intermediaries tend to respond to the requests and demands of end-use clients (i.e. the market is demand-, rather than supply-, driven). However, the ability of intermediaries to apply techniques of financial engineering to create entirely new contracts has helped the market develop successfully. Leading intermediaries can use their knowledge of markets, client requirements, and valuation techniques to develop useful, customized assets that meet specific needs. Intermediaries that can couple financial creativity with a significant amount of risk-taking are well positioned to win client business.

1.2 DRIVERS OF MARKET ACTIVITY

Financial instruments develop and evolve in the marketplace in order to serve a specific function. If that function is performed successfully, the instrument gains a following and succeeds; evolutionary iterations may then follow, permitting further expansion. If the function is not performed successfully, the instrument will eventually fade from use. The specific synthetic and structured assets we discuss in this book include those that have proven successful over a period of time; the instruments have achieved a critical mass of interest by addressing the needs of participants properly. In each of our individual product chapters we shall consider a series of market drivers that have fuelled market development and growth. All, however, trace their foundation to a core series of goals that intermediaries and end-users attempt to meet. In this section we consider, in generic form, some of these elemental market drivers.

Institutions are active in the capital markets in order to achieve one or more core goals related to some aspect of financial management; the synthetic and structured assets we consider in the book can help achieve any, or all, of these goals.

Broadly speaking, core financial management goals include:

- **Funding.** An institution that needs to finance its operations in the external capital markets (rather than via internally generated funds) attempts to do so in an optimal fashion. This generally means arranging the lowest cost of funding while maintaining a balanced portfolio of liabilities across markets and maturities. Synthetic or structured liabilities are used routinely to both lower funding costs and provide new or incremental investor/market access.

- **Hedging.** An institution with exposures that can impact inputs or outputs typically tries to protect against potential downside risks in order to minimize the chance of losses. This is often accomplished through a formal or informal hedging program that makes use of appropriate hedges. Once again, synthetic and structured contracts can be used to create the best possible hedge for an exposure.

¹ Even within the overall sector, we can observe differences in market liquidity; some assets, such as senior-rated tranches of collateralized debt obligations or stripped US Treasuries, feature a reasonable degree of market liquidity, while others, such as privately placed credit-linked notes with embedded exotic options, feature much less liquidity (and effectively must be considered “hold until maturity” contracts).
4 Synthetic and Structured Assets

- **Investing/yield enhancing.** An institution (or department within an institution) that exists solely or primarily to invest cash or capital on behalf of internal operations or external parties again attempts to achieve its investment goals in a rational and cost-effective manner by optimizing its risk/return profile. Specific synthetic or structured assets are often an effective mechanism for increasing returns while preserving a desired risk profile.

- **Speculating.** An institution that is responsible for generating asset returns by taking a greater amount of risk will again seek to achieve its goals by implementing its speculation program in a manner that is structured appropriately with regard to concentration, volatility, leverage, and liquidity. Again, many of the synthetic and structured assets we consider in the text permit establishment of maximum speculative positions, including those that are heavily leveraged and/or exposed to complex and volatile risks.

Naturally, these core goals exist because of financial market volatility, a characteristic of the modern financial markets that generates both risk and opportunity. As long as market volatility remains a feature of the landscape, and there is little to suggest that it will disappear or even decline, then these goals should remain intact, helping to fuel further innovation and activity.

Each of these goals, which together comprise the essence of corporate financial activity, can be met through the use of conventional financial assets and contracts. For instance, a company seeking funding may choose to access the Eurobond or the syndicated loan markets. One that is attempting to hedge an interest rate exposure may opt for the listed bond futures markets. Those trying to invest, yield enhance, or speculate can select from a range of cash or derivative instruments. It is also true, however, that each of these goals can often be met more effectively by using synthetic and structured instruments. Thus, the company seeking funding may find it more cost effective to issue a floating-rate note with an attached swap that converts its interest expense back into a fixed cost, or sell a fixed bond with embedded options to lower its all-in funding cost. Similarly, the investor seeking to speculate on a particular index may choose to introduce a leveraged payout in order to increase its risk/return profile.

So, synthetic and structured assets can help achieve core goals in a better way. The act of repackaging, restructuring, or synthetically replicating asset or liability profiles can lead to the same funding, hedging, investing, or speculation profiles – at a lower cost or for a higher return, and almost certainly in a more efficient manner. This brings us back to our earlier statement – financial instruments survive and thrive when they are useful. The assets we discuss in this book have become established in the marketplace precisely because they are useful in helping institutions achieve their fundamental corporate goals.

Certain other forces supplement the items we have noted above, and serve as additional drivers:

- **Regulation and market access.** An institution may want to participate in a specific market – from an asset or liability perspective – but may be unable to do so as a result of regulatory restrictions or barriers to entry. When this occurs, synthetic/structured contracts can often open up the marketplace to relatively free participation.

- **Asset creation.** An institution may seek a very specific asset or liability profile in order to fulfill risk, funding, or investment mandates. If this is not available in the conventional financial sector, structured and synthetic instruments can surface as potential alternatives by allowing the creation of instruments with relevant yield, maturity, currency, return, and/or risk characteristics.

- **Liquidity creation.** An institution may be impacted by lack of market liquidity in select assets or liabilities that form part of its activities; this may be a temporary or permanent
condition that can prevent a firm from arranging transactions in the most economic manner possible (i.e. the illiquidity of market is reflected directly in the size of the bid-offer spread). Structured and synthetic instruments can be used to inject a level of liquidity into the market, returning an institution to a more cost-efficient position.

- **Balance sheet optimization.** An institution that actively manages its assets and funding and capital levels may find it beneficial to use assets or liabilities that help optimize its goals; in some cases, this may involve transferring exposures off balance sheet via synthetic and structured assets.

- **Pooling and diversification.** An institution that is attempting to create a balanced portfolio of risk exposures may find it can do so most effectively by using vehicles that can pool and diversify risks through a single transaction. A variety of synthetic and structured assets can help accomplish this goal.

- **Tax benefits.** An institution seeking to exploit tax differences between marketplaces legally in order to reduce friction costs can do so using certain classes of synthetic/structured contracts.

These primary and secondary drivers, summarized in Figure 1.1, have led to progressively greater expansion and innovation in the financial markets. Although we have framed our discussion in general terms in this section, we shall revisit the topic throughout the book in order to reinforce the point that new products are not created simply to demonstrate financial engineering skills or generate profits – they are developed by intermediaries in order to fulfill the specific needs of institutions in the best way possible. Profit streams can be sustained when products meet client demands.

### 1.3 NEW PRODUCT DESIGN

Financial intermediaries create new types of product in order to address client requirements. Some new structured/synthetic products are successful, and many others are not; some achieve widespread volume or carve out a niche, while others simply fade. When a product no longer attracts meaningful interest and ceases to be traded, it is abandoned. Most new products that
become accepted in the marketplace feature margin compression over time as more intermediaries and end-users join in the process. This profit compression, coupled with the desire to service client needs, leads intermediaries to create more new instruments.

A new product must feature certain basic characteristics in order to succeed. These characteristics may relate to the product itself, the underlying asset market, or the regulatory/tax environment – or all three. Market evidence suggests that a new product is more likely to be successful when participants (or potential participants) recognize the value it can provide and wish, therefore, to participate; that is, intermediaries do not need to “convince” participants of the benefits of entering the marketplace. Such demand-pull, rather than supply-push, creates a healthier and more sustainable equilibrium. In general, greater likelihood of success exists when:

- The underlying asset is homogenous, storable, and price-volatile, it is in abundant supply and features good price transparency (e.g. is not subject to manipulation).
- The asset and its price performance are transparent enough to attract the attention of investors, hedgers, and speculators (e.g. parties that can help promote liquidity).
- The asset market is developed to the point where there is reasonably strong two-way flow, ensuring a minimum base of liquidity; indeed, the asset should be linked to other cash or hedging markets in order to build on two-way flows.
- Regulatory and tax treatments are equitable, or those featuring differences/discrepancies can be arbitraged. In fact, regulatory issues have been, and are likely to remain, a significant influence in the design of new products and aftermarket activity. If the regulatory environment moves towards a “level playing field” across national boundaries, then the likelihood that more institutions can participate in a new asset when it is launched increases significantly.2
- There is accounting clarity regarding the instrument. The distinction between debt and equity creates significant tax implications, and must therefore be considered carefully. For instance, debt-related structures may feature interest tax deductibility, while equity-related instruments may face double taxation of dividends (e.g. taxation at the issuer and investor level, unless the issuer is a strict pass-through entity).
- Costs are reasonable. Expenses associated with accounting and regulatory requirements, along with stamp duties, clearing/settlement expenses, arranging costs, and other trading-related spreads, cannot overwhelm the economic rationale for structuring or executing a transaction.3 The low-cost providers may emerge as leaders in a highly competitive financial market.

New product development is, unfortunately, an expensive and time-consuming process. For instance, structures that are meant to be listed and traded very widely (rather than as private placements, for instance) must be vetted rigorously from a legal and regulatory perspective; this is especially true if the product is intended for purchase by retail investors. In some instances, this can take several years to accomplish. Intermediaries supporting this type of

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2 For instance, the original PRIMES and SCORES structures we consider in Chapter 8 were “derailed” by unfavorable rulings from the Internal Revenue Service (IRS). The IRS eventually changed its position and allowed the securities to proceed through a “grandfathered” grantor trust scheme, but no new trusts were ever formed and the product was eventually wound down, to be replaced by Morgan Stanley’s new synthetic version (without the attendant regulatory complications). Similarly, Lehman’s attempt to create unbundled stock units comprised of a coupon bond, growth/income certificate (dividend security), and equity appreciation certificate (call warrant) met with fierce regulatory and tax resistance, and was abandoned before launch. Many other examples exist.

3 For example, Deutsche Bank’s country basket of stocks failed to displace Morgan Stanley’s world equity baskets because the bank attempted to reduce tracking error by adding too many small stocks, which added considerably to the costs of trading, custody, and settlement.
development must be prepared to invest human and capital resources in order to reap benefits; in this sense, they operate just as any other corporation might: allocating capital and human resources to the creation of a profitable venture that may take months or years to develop and market. But their role does not cease with the introduction of a new product. In many instances, financial intermediaries must continue to support the asset by providing ongoing liquidity (market-making) or by assuming a certain amount of credit, market, or liquidity risk. Thus, even after a product has been launched successfully, its ongoing viability may depend in large part on continued participation by the community of intermediaries. This means, of course, that banks, securities firms, and other product creators must be compensated for risks taken in supporting the product. Unfortunately, profit margins on new products can compress quickly as a result of competitive pressures, suggesting that a misbalancing of risk/return may arise.

Participation in new products generally proceeds through evolutionary stages. Activity might begin on a very modest scale, with a few intermediaries and end-users arranging transactions. After some level of experience is gained, changes in the core structure might be implemented in order to resolve problems, reduce costs, or improve efficiencies. Enhancements may then lead to greater product marketing by intermediaries and a gradual accumulation of critical mass. If products are truly customizable, end-users may then begin demanding greater flexibility in risk/return profiles to meet their needs more accurately. The end result for the successful new product is a strong base of demand, leading to improved liquidity and tighter pricing – all while addressing specific client needs. Much of what we have noted above applies to the product development process in any current or immediate period. However, truly innovative intermediaries plan ahead, attempting to estimate or predict future client requirements in a new market environment. By doing so, intermediaries can anticipate, rather than react to, client demand – gaining valuable time over competitors.

1.4 OVERVIEW OF THE TEXT

There are various ways in which a text on financial contracts can be structured: by marketplace, function, product, risk characteristics, geography, and so forth. Each approach has its own merits and, in some instances, shortcomings. We have opted, in this text, to follow a product focus, which allows us to inject uniformity into a discussion that spans multiple asset and liability classes. Accordingly, for each of the product chapters (i.e. Chapters 3 through 10), we include a discussion of market development, growth, and drivers, along with product mechanics and practical applications. Again, though various approaches can be used to separate the broad class of synthetic and structured products, we have selected the following categorization:

- Chapter 3: callable, puttable, and stripped securities, including corporate and government bonds with options or stripped coupons.
- Chapter 4: mortgage- and asset-backed securities, including pass-through securities, mortgage bonds, collateralized mortgage obligations, and receivables/loan-backed securities.
- Chapter 5: structured notes and loans, including interest rate, currency rate, equity, commodity, and credit-linked notes, bonds, and loans.
- Chapter 6: collateralized debt obligations, including cash flow, market value, arbitrage, balance sheet, structured, and synthetic collateralized bond and loan obligations.
- Chapter 7: insurance-linked securities and contingent capital, including catastrophe bonds, noncatastrophe bonds, contingent debt, and contingent equity.
Figure 1.2 Scope of synthetic and structured asset coverage

- Chapter 8: convertible bonds and equity hybrids, including convertible bonds, mandatory convertibles, zero coupon convertibles, reverse convertibles, bonds with equity warrants, and synthetic buy/write packages.
- Chapter 9: investment funds, including open- and closed-end mutual funds, hedge funds, and exchange-traded funds.
- Chapter 10: derivative replication, repackaging, and structuring, including synthetic long and short option and swap positions, multiple option/swap positions, callable/puttable asset swap packages, and credit derivatives/synthetic credit positions.

Figure 1.2 summarizes the scope of our product coverage.

Two other chapters supplement the product-specific chapters:

- Chapter 2: Financial Building Blocks, which considers the essential concepts and tools needed to construct or decompose synthetic and structured assets, including derivatives, host securities, and issuance/repackaging vehicles.
- Chapter 11: Risk, Legal, and Regulatory Issues, which addresses the risk management, financial control, accounting, legal, and regulatory frameworks that surround these unique contracts.

With this background in hand, we are now prepared to begin our discussion of synthetic and structured assets by examining the basic tools that are used to create unique contracts.