

JPMORGAN STRUCTURED INVESTMENTS SOLUTION SERIES

**Volume 1.0 – Principal Protected
Solutions**



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A man and a woman in business attire are shaking hands over a table. The man is on the left, wearing a light blue shirt and a dark tie. The woman is on the right, wearing a light blue blazer. They are both smiling and looking at each other. The background is a blurred office setting with large windows.

JPMorgan Structured Investments Solution Series for Investors

Volume 1.0: Principal Protected Solutions

JPMorgan Structured Investments is pleased to offer the first edition of the *Solution Series for Investors*.

JPMorgan's Structured Investment professionals are committed to providing innovative new investment tools to help investors achieve their financial goals. In this volume, we describe Principal Protected Investments. Subsequent volumes of the *Solution Series* will describe other Structured Investments. Each volume seeks to help you identify the common financial challenges that Structured Investments are designed to help investors handle.

In today’s market environment, investors are confronted with a variety of investment alternatives. For some investors, choosing among them is made more difficult by the need to save for predictable future obligations. For others, the decision is complicated by common behavioral biases that may lead to poor financial choices. Principal Protected Investments combine features of fixed income securities--return of principal at maturity--with riskier asset classes such as equities, that have higher return potentials.

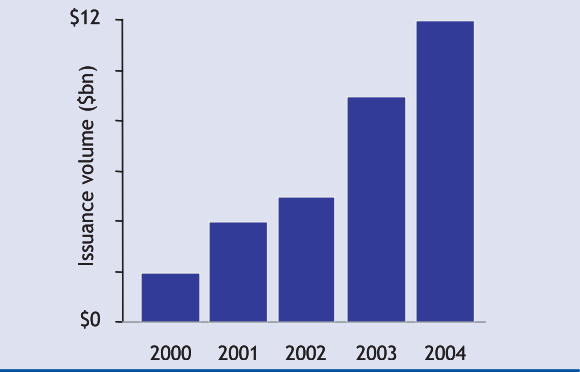
What are Principal Protected Investments?

As the name implies, Principal Protected Investments offer the return of the initial principal investment at maturity. In this respect they are similar to fixed income investments, but they generally allow investors to earn additional returns that are tied to the performance of another asset class, such as an equity index. In general, Principal Protected Investments are created to provide investors with a product that will insulate against market losses at maturity, while preserving some gains from market appreciation. These Structured Investments may be linked to equity, interest rate, commodity, and currency underlyings. Principal Protected Investments are generally issued as

registered notes or certificates of deposit. For illustrative purposes, we will discuss Principal Protected Notes (“PPNs”) linked to the equity market for the remainder of this booklet.

PPNs have historically been the best selling category of Structured Investments in the United States. As a category, PPNs represent approximately 40% of registered Structured Investment issuance in the U.S. market. Sales of registered Structured Notes reached \$12 billion in 2004 (see Figure 1). These instruments are firmly established in Europe. Despite an explosive 60% per annum growth rate since 2000, these pioneering investments

Figure 1: Total Registered Issuance of Structured Investments



Source: Edgar Filings

remain relatively unknown in the United States retail market.

Over the past few years, in exchange for full downside protection, a 3 to 7-year PPN on the S&P 500™ Index offered investors participation in index appreciation that ranged between 50%

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and 100% of their principal investment. Known as the participation rate, this percentage is dependent on several factors, including the terms of the specific PPN, the equity index chosen and the prevailing market conditions. The terms of each PPN vary greatly depending on the underlying asset, amount of protection offered, maturity, and minimum or maximum return payouts provided.

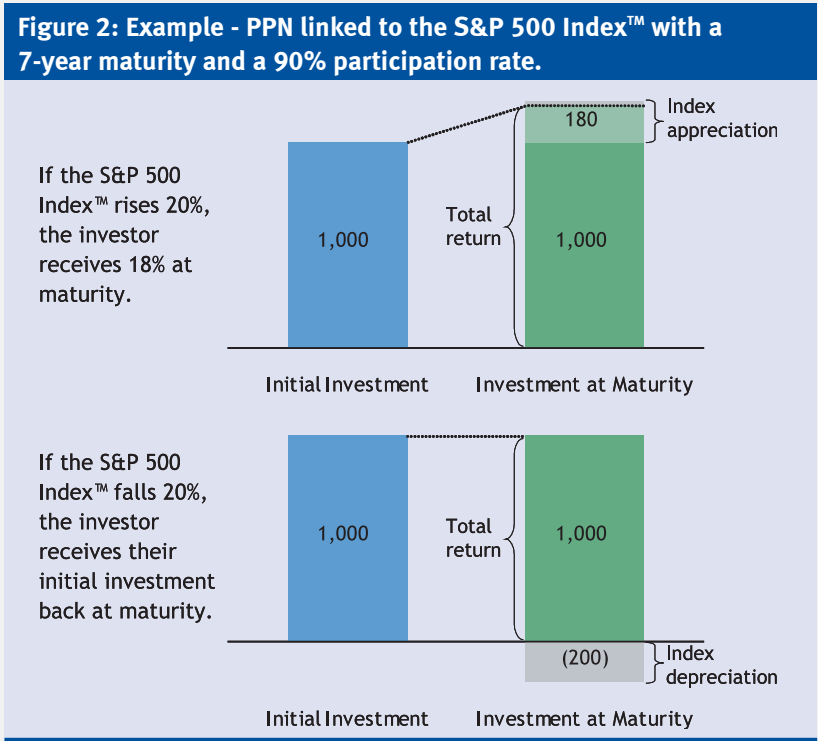
Who Should Consider Principal Protected Notes?

PPNs provide investors with potential payout combinations that they may not be able to achieve through other single traditional investment alternatives. In simple terms, PPNs protect investors against the losses they might incur if equity markets decline at maturity. Unlike typical insurance policies, however, PPNs do not require investors to make an upfront payment for the protection they receive. Instead, they “pay” by giving up their dividend and interest income and typically a portion of upside gains in the event that equity markets rally.

As an example, Figure 2 highlights the downside protection that a 7-year PPN linked to the S&P 500 Index™ offers. It illustrates the payouts that investors would receive in the event of two possible outcomes for the S&P 500 Index™, a 20% increase and a 20% decrease. If the

index declines, investors receive back their original principal at maturity, avoiding what would otherwise have been a \$200 loss. However, investors must pay for this downside protection that they receive. They do so in the event that the S&P 500 Index™ increases 20%, by earning \$180 rather than the \$200 (not including dividends) they would have earned had they invested instead in an S&P 500 Index™ fund.

So, is this protection attractive for investors? If the S&P 500 Index™ could only either increase or decrease by 20% then this question would be simple to answer. If so, investors could estimate the probability of each outcome, and decide how much they’d be willing to “pay” when equity markets increase to protect against a dollar’s worth of losses when they decline. The 7-year PPN may be more attractive for those investors who are more pessimistic than average about the future direction of the equity markets, for those more willing than average to pay



Source: JPMorgan

for downside protection, or both.

Obviously, there are an infinite number of potential outcomes for the S&P 500™ Index. While this renders simple calculations infeasible, the general principle remains. The price of the downside protection that each PPN offers is fundamentally determined by the market's assessment of the probability of each potential equity market outcome and investors' overall preferences for transferring wealth between them. PPNs are likely to be attractive to those investors whose probability assessments or relative preferences differ from those of the broader market. Below, we highlight three types of investors for whom this is likely to be the case.

1. Investors Who Are Saving for Life's Milestones:

For many investors, the choice of investment strategy is dominated by the need to save for life's many milestones. Whether saving for a down payment on a house, college tuition, or even retirement, investors have a good sense of the minimum amount they will need to provide for a specific future event. For these investors, potential returns above this minimum amount are nice but not necessary. Conversely, investment strategies leaving them with less than they need are intolerable. As a result, traditional equity investments are unlikely to provide a desirable risk-return trade-off. Instead, fixed income or cash-based investment alternatives that sacrifice the potential for equity returns are often considered the viable alternative.

In many regards, PPNs are ideal for investors saving for future milestones. These investors are exactly the type who are eager to sacrifice potential upside returns in order to protect against downside losses. Their relative preference for wealth in the event that equity markets decline is likely to be much greater than that of average investors. Since PPNs allow them to choose a maximum loss (0%, 5%, 10%) at a maturity that is consistent with their specific future obligations, investors saving for life's milestones can obtain just the amount of downside protection they need while retaining as much upside potential as possible.

2. Investors Reluctant to Participate in the Equity Markets:

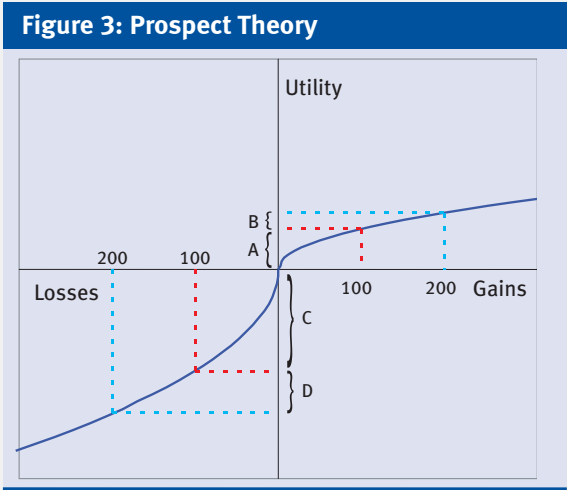
According to classical finance theory, "rational" individuals evaluate alternative investments in terms of a simple risk-return trade-off. They are willing to take on additional risk (typically measured with either beta or total volatility) whenever an investment's expected return is high enough to compensate for it. From this perspective, it is hard to conceive that investors would not find some degree of equity market exposure to be advantageous. Even so, many financial advisers have surprising difficulty convincing some clients to incur what seems to be a "rational" amount of equity market exposure. Recent research in behavioral finance offers a powerful potential explanation. It asserts that investors do not evaluate investments according to the classic paradigm. Instead,

Prospect Theory asserts that investors evaluate potential gains and losses relative to some initial reference point, often the initial amount that they have invested. Figure 3 depicts the value function of an individual who evaluates investments in terms of Prospect Theory. Notice a couple of its key features. First, the value investors attribute to additional gains is decreasing in their magnitude. In other words, investors are happy when they gain \$100, but they are not twice as happy when they gain \$200. Graphically, this is represented by the fact that Segment A is much larger than Segment B. On the other hand, investors hate losses. In fact, Prospect Theory asserts that they lose much more value from a \$100 loss than they gain from a \$100 gain (i.e. Segment C is larger than Segment A). For this reason, individuals who

investors considered above. Potential gains over and above their initial investment are nice, but the greater they are the less they are valued. On the other hand, any loss is particularly costly. Expected returns are simply not relevant, because gains and losses are evaluated in an entirely different manner. Much like investors saving for future milestones, these investors are likely to place a high value on the opportunity to transfer wealth from high equity return outcomes to low ones. As a result, they are likely to be attracted to the payoff combinations that PPNs offer, even if they are unwilling to invest in more traditional equity investments.

3. Investors Who Can't Let Go:

Some investors have such a high degree of confidence in their investment decisions that they cannot let go of losing stocks. As a result, they can unwittingly incur unacceptably large losses when equity markets decline. Recent research has demonstrated a “break-even” effect for active traders. Once they incur losses, they tend to take excessively risky gambles hoping to break even. This tendency, like loss aversion, is represented graphically in the Prospect Theory value function presented in Figure 3. Once the investor has lost \$100, an additional loss “costs” very little, while “winning back” enough to break even represents a very large potential gain. Breaking even wins back the entirety of Segment C for the investor, while losing an additional \$100 imposes an additional cost of “only” Segment D.



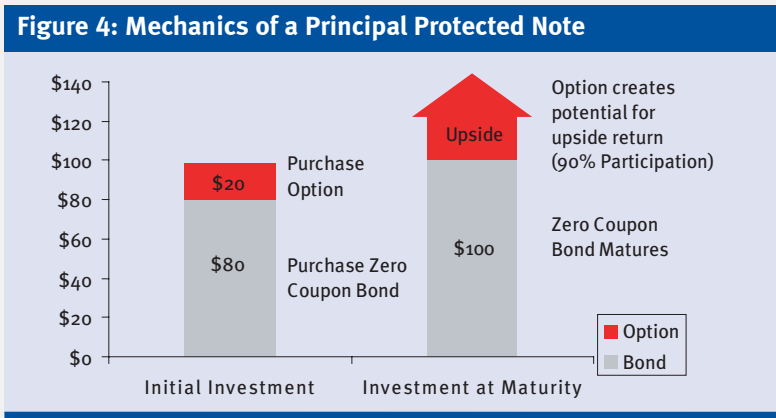
Source: Daniel Kahneman and Amos Tversky, “Prospect Theory: An Analysis of Decision Under Risk,” *Econometrica* 46(1979): 171-185

evaluate potential investments in terms of Prospect Theory are often described as “loss averse.” In many regards, loss aversion leaves investors in a similar situation to the

As a result, research has shown that investors tend to hold on to their losing equity market positions even if they should have reallocated at least a portion of their funds to safer fixed income investments.

PPNs are one way for investors to ensure that they don't end up in this unenviable position. If equity markets decline, PPNs most closely resemble fixed income investments by preserving the initial principal invested at maturity. As a result, investors avoid the excessive risk taking often caused by the break-even effect. When equity markets rally, PPNs more closely resemble traditional investments in equity market index funds. So, for investors who can't let go when equity markets decline, PPNs offer a valuable way to avoid dangerous behavioral biases without sacrificing the potential for equity returns.

Fundamentally, a JPMorgan Equity Linked Principal Protected Note combines the investment characteristics of an equity call option with that of a zero coupon bond in a single instrument. As depicted in Figure 4, a substantial portion of the initial investment is used toward the purchase of a zero coupon bond (ZCB), with a par amount equal to the initial investment. Zero coupon bonds have a given discount reflecting prevailing market yields (grey area). The remaining portion of the initial investment is used to buy an at-the-money equity call option on a broad based equity market index, such



Source: JPMorgan. A Principal Protected Note is the combination of a zero coupon bond and a call option on the underlying index.

Is Now a Good Time to Buy PPNs?

For the type of investors described above, any time is a good time to consider PPNs for their portfolio. Each is likely to place more value on the downside protection they receive than the income and potential market gains they forego. For other investors, however, current participation rates for equity linked PPNs suggest now might be a good time to consider these for their portfolio. In order to see why, it is helpful to dig a bit deeper into how JPMorgan Equity Linked PPNs are created.

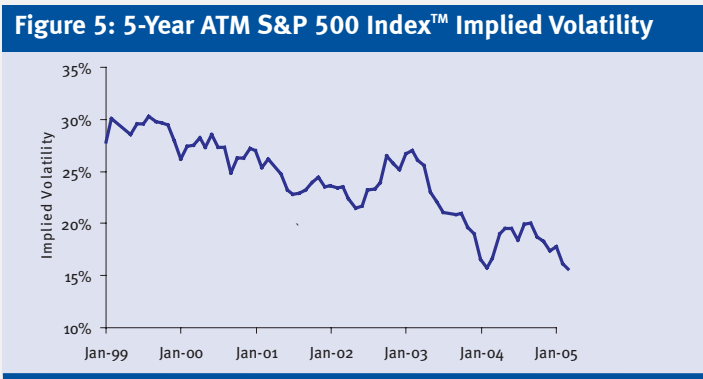
as the S&P500 Index™, with an expiration that matches the maturity date of the zero coupon bond (red area).

The initial “principal” investment is hence “protected” through the zero coupon bond which will mature at par on some date in the future, called maturity. Meanwhile, investors participate in a portion of the potential gains in the equity market through the call option. In the example in Figure 4 above, PPN investors retained 90% of the equity market upside potential. We call this amount the

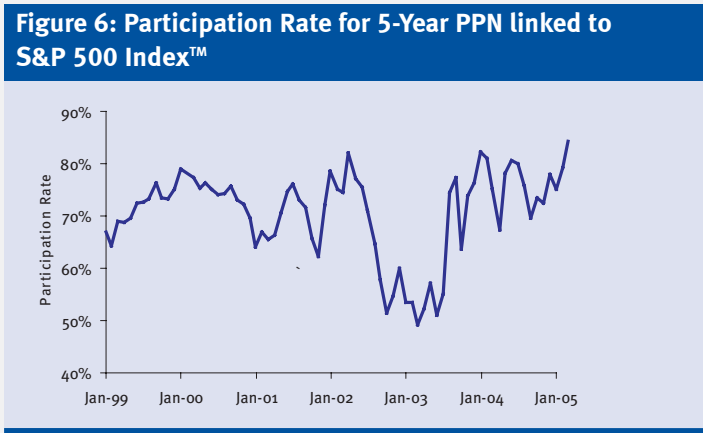
participation rate. It is fundamentally determined by two factors: the cost of the equity call option and the remaining investment amount available after purchasing the ZCB. The latter amount determines how much money is left over with which to buy equity options, and the option price determines how many options can be purchased.

There are a number of ways to increase participation rates when creating a PPN. First, the amount paid for the ZCB can be reduced by lengthening the time horizon

component of most option pricing models is the *implied volatility* of the relevant equity index. Assuming all else constant, lower implied volatility decreases the price of the call option embedded in the equity linked note and thus, in turn increases the participation rate for the investor. However, this feature cannot be controlled by the issuer and is subject to market conditions at the time of pricing. Currently, S&P 500 Index™ implied volatility is at relative lows (see Figure 5). Consequently, participation rates in equity linked notes are higher than they



Source: JPMorgan



Source: JPMorgan

or accepting less than full downside protection. This provides more resources for the purchase of equity call options. Another way is to lower the price of the call option purchase. Option pricing is fairly complex, but the essential

might be in a higher volatility environment (see Figure 6).

Can't I Create My Own PPN?

Sophisticated financial advisors and investors might question whether they could attempt to replicate the payoff of a Principal Protected Note. Investors trying to replicate the payoff of a Principal Protected Note may find it both costly and impractical. Structured Investments provide both the convenience and financial engineering necessary to give investors and financial advisors easy access to alternative investment opportunities.

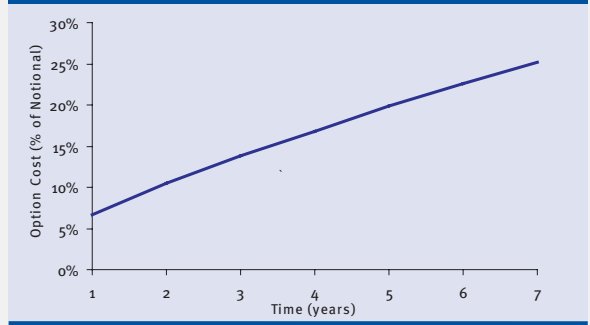
We can illustrate the complications, costs and practical disadvantages for individual investors trying to replicate principal protected products by two different means. Again, we will use the S&P 500 Index™ as an example.

1. Hypothetical replication strategy using a zero coupon bond and listed S&P 500 Index™ call options

- Specific dates and long-dated maturities are difficult to coordinate. Zero coupon bonds on government securities, or treasury strips, as well as exchange listed options on the S&P 500 Index™, are only available for specific maturity dates, and generally not for maturities greater than two to three years. Although investors might find a zero coupon bond with close to a seven year maturity, it will be very difficult, practically impossible in fact, for investors to find a listed call option with a seven year maturity. Consequently, to achieve their desired investment horizon through a replication strategy, investors will need to purchase a series of options over time to replicate the performance of a 7-year Principal Protected Note.
- Longer-dated options can be “cheaper” than a string of short-dated options. As Figure 7 illustrates, the price of an option increases with extended maturity, but not linearly. The average yearly cost of an option (as a percentage of S&P 500 Index™ level) decreases with increasing maturity. Buying a string of several short-dated options will prove more costly than buying one long-dated option of equivalent maturity. For example, buying a 2-year call option every 2 years for 6 years ($3 \times 10.5\% = 31.5\%$), will cost more than one 6-year option (22.75%), assuming implied volatilities remain the same.
- Buying and rolling listed equity call options leaves the investor exposed to

additional market risks. Should implied volatility increase during the implementation of the replication strategy, the investor will be paying a greater price for the call option portion of the PPN. Additionally, the investor’s exposure becomes dependent on the path of the S&P 500 Index™. For example, suppose the S&P 500 Index™ declines during the replication strategy. The investor will have lost their entire premium invested and will need to purchase a new call option in a potentially higher implied volatility environment. By purchasing a Principal Protected Note with a fixed maturity, the investor has

Figure 7: Option price increases with time



Source: JPMorgan

- “locked-in” their exposure to both equity index levels and implied volatility.
- Frequent trading results in higher brokerage commissions. Each time an investor transacts, they pay a brokerage commission. Trading several short-dated listed options to replicate a PPN might result in greater trading costs than buying a single PPN.

2. Purchase of a Zero Coupon Bond Fund (ZCB) and an Index Fund

An investor may question whether investing in a ZCB and shares of an Index Fund will outperform a Principal Protected Note. This combination provides at least partial long term capital gains tax treatment (on gains in the mutual fund) and capital is not being invested in a call option that loses value with time.

Making several assumptions about tax rates and pricing (see Appendix A), as long as the S&P 500 Index™ returns greater than about 5.9% per year over the life of the PPN, the PPN will outperform an investment in a ZCB and Index fund (see Figure 8 in Appendix A). Over the past 20 years, the S&P 500 Index™ has returned 10.4% per annum on average.

Conclusion

Structured Investments can be valuable investment tools if properly understood and applied. As investors focus on their market view, risk tolerance and balancing their financial obligations, a clear investment thesis will often crystallize into an Structured investment opportunity. The ability of these investments to provide principal protection while offering equity upside creates investment vehicles to meet a variety of investment needs and concerns. Structured Investments are increasingly popular around the globe as investors continue to discover their advantages as a portion of a balanced portfolio.

Appendix A

Analysis of the Replication of a Zero Coupon Bond Fund and an S&P 500 Index™ Fund.

Table 1: Assumptions

Hypothetical PPN		Hypothetical ZCB and S&P 500 Index™ Fund	
Underlying	S&P 500 Index™	Index Fund	S&P 500 Index Fund
Maturity	7 Years	Dividend Yield	1.94%
Initial Investment	\$1,000	Initial Investment	\$1,000
ZCB Present Value	73.96%	ZCB Price	\$739.60
Principal Protection	100%	Principal Protection	100%
Initial Index Level	1200.00	Initial Share Price	\$120
Participation Rate	95%	Number of Shares	2.17

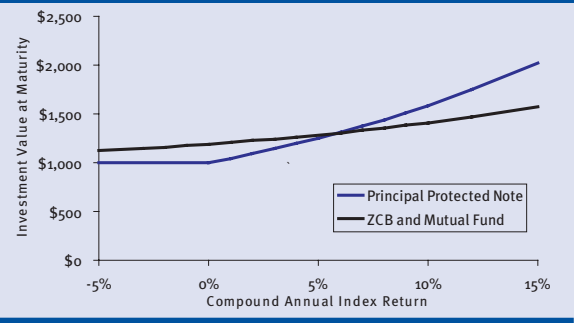
Source: JPMorgan

LTCG Tax Rate: 15.00%
Income Tax Rate: 35.00%
Constant Yield: 4.40%
Annual Fund Fees: 0.50%

In the following graphs (Figure 8 & Figure 9), investment returns are shown for compound annual index returns between - 5% and 15%. The “Principal Protected Note” and “ZCB and Mutual Fund” lines indicate the approximate net position at maturity for an investor who implemented the investments for 7 years. The taxes paid are based on the phantom income (OID) taxes paid on the ZCB and the PPN, the income taxes paid on the PPN at maturity, and the long term capital gains paid on the Index fund at maturity.

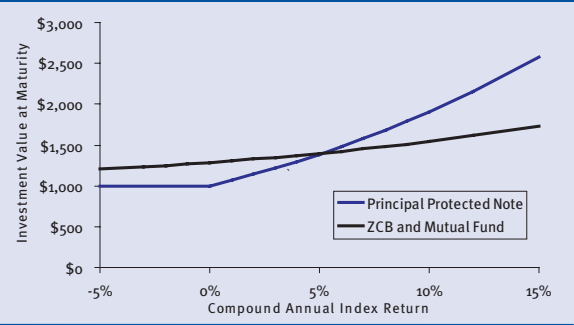
Figure 8 and 9 demonstrate that a PPN will significantly outperform purchasing a ZCB and an Index fund when the compound annual index return is greater than 5.9%.

Figure 8: PPN versus ZCB + Mutual Fund (Taxable Investor)



Source: JPMorgan

Figure 9: PPN versus ZCB + Mutual Fund (Non-taxable Investor)



Source: JPMorgan

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