Global FX Strategy
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Answers to 10 common questions on EMU breakup

- **Client inquiries around euro breakup have risen exponentially over the past month, probably triggered by the November German/French ultimatum that Greece should vote on its EMU membership.**
- **This note answers 10 common questions on EMU breakup based on J.P. Morgan research published over the past two years (see box). It also updates hedging recommendations in the euro and proxy currencies given current levels of FX volatility and options skew. Long-dated (3Y-5Y) AUD puts/USD calls offer better value than OTM EUR puts/USD calls that have seen heavy tail risk hedge buying.**
- **Given the unprecedented nature of a currency union's demise on this scale, conclusions are somewhat conjectural. This article reflects J.P. Morgan FX Strategy's interpretation of the Lisbon Treaty, ISDA guidelines and standard industry contracts and not the opinion of its Legal Department. Clients should consult their counsel as to the legal implications of the scenarios addressed in this note.**

Previous J.P. Morgan research on EMU breakup

Exiting EMU: the legal, the likely and the ludicrous, Normand, February 19, 2010.

Legal aspects of sovereign debt restructuring, Wadhwa, *Global Fixed Income Markets Weekly*, December 10, 2010.

Breaking up is hard to do, Mackie and Barr, September 2, 2011.

Rightsizing the euro won't make it more stable, Normand, *FX Markets Weekly*, November 4, 2011.

Euro: the make-or-breakup year, Normand, *Global FX Strategy 2012*, November 22, 2011.

1. How could the Euro area break up?

The Lisbon Treaty governing the European Union (27-member trade bloc) makes no provision for exiting EMU (17-member monetary union), whether voluntarily or by expulsion. It only provides a mechanism for countries to negotiate their exit from the EU (Article 50). Since monetary union is an explicit, legal requirement for all EU countries except those which have negotiated an opt-out[1], exiting the EU presumably requires exiting EMU. Thus under current treaty provisions a country could exit the monetary union by withdrawing from the customs union. There is no provision for exiting EMU while remaining in the EU in order to secure a position similar to the UK's, in which a country retains the rights of the free trade bloc but isn't bound by its policy rates and currency regime. Either core countries could exit to avoid the costs of monetary union, or peripheral countries could leave to regain the benefits of independent monetary and exchange rate policy (see question 4).

Even without recourse to Article 50, there is another potential path to euro breakup. The Lisbon Treaty makes frequent reference to the **solidarity principle** under which members are expected to share in the EU's purported advantages (prosperity) and its responsibilities (budget discipline). Potentially a country's failure to repay bilateral loans extended by the core during the sovereign crisis could be construed as a blatant violation of the solidarity principle, an act which may then motivate core countries to agitate for expulsion. Alternatively the core could attempt to force a country to withdraw under Article 50 by withholding resources such as access to ECB funding for a country's banking sector.

2. What would be Europe's successor currencies under various scenarios?

Although some countries outside the Euro area use the euro[2], a **weak country that withdrew or was expelled** from EMU would need to introduce its own currency. Whether this currency were a legacy currency (drachma) or a newly-minted one is immaterial. The key point is that within that country's borders, something other than the euro has become legal tender, or the mandatory means for settling obligations (see question 5).

If core/strong countries withdrew, it is unclear whether they would continue to use the euro or would introduce a new medium of exchange. The ECB could remain the central bank for some critical mass of countries, and since the euro is understood to be the currency issued by the ECB and the national central banks within the euro system, the current euro could continue to circulate as legal tender.

A more contentious situation arises if the core splits into perhaps a German/Austrian/Dutch monetary union versus a French/Belgian currency zone, both of which might wish to

[1] The UK and Denmark have negotiated legal opt-outs while Sweden's is informal.

[2] Monaco, San Marino and Vatican City use the euro under formal agreement with the ECB, whereas Montenegro, Kosovo and Andorra use the currency without an accord.

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retain the physical euro as their currency but operate independent monetary policy under their respective central banks. Since no country or countries can claim entitlement to the euro – the treaty defines the euro simply as the currency issued by the European System of Central Banks and accepted as legal tender within the Euro area – ownership would become an issue for negotiation between the two camps. (Note there is no international forum for sovereign arbitration on financial issues comparable to the World Trade Organisation for trade disputes). If the core split, the question of who retains the euro isn't trivial given the logistical challenges of introducing a new currency (see question 3). Recall that the physical euro was only introduced three years after the euro was launched as an electronic currency in 1999.

If the euro ceases to exist, either because all countries revert to their legacy (pre-EMU) currencies or core countries choose to launch monetary union under another treaty, then **several countries will need to rethink their currency regimes**. Those which manage their currencies against the euro (currency floor of EUR/CHF 1.20 in Switzerland, and euro pegs in Denmark, Latvia, Lithuania, Bulgaria and Africa's CFA franc zone) would need to anchor to another currency or to a basket of currencies. They could also float their currencies (see question 6). Micro-states using the euro as legal tender (Monaco, Andorra, San Marino, Vatican City) would need to revert to their legacy currencies or adopt some other liquid pair.

3. What are the practicalities of replacing the euro?

In a modern financial market dominated by electronic payments and in a zone free of capital controls such as the Euro area, the switch to an alternative currency would need to be secretive and practically immediate to be effective. Mere suspicion of a regime switch would be sufficient to drive massive deposit flight into euro accounts in other countries, or conversion into non-euro currencies outside of the region. Most likely a country would **decree overnight** that the country's legal tender had changed from euros to the new currency at a declared conversion rate, and that all accounts and contracts would be **redenominated immediately** to reflect the new regime. All financial markets would be shut and banks closed from some period – perhaps several days – to allow the conversion (see question 5 on contract settlement).

Normally this bank holiday would also allow the authorities to **stamp physical notes and coins** to designate them as an interim currency until a successor can be minted and distributed. This interim step may not be necessary with EMU exit since all euro coins bear the name of the country where minted, and all notes contain a letter in the serial number indicating where the bill was printed.[3] This coding is analogous to the US system in which the 12 regional Federal Reserve Banks print bills stamped with numbers 1 to 12, while four US mints issue coins. A country leaving EMU thus could declare that only the notes and coins it has issued are legal tender, hence obviating the need for franking. This approach is still cumbersome, however, since notes and coins issued by various Euro area central banks circulate throughout the region just as U.S. dollar bills printed by the various Federal Reserve Banks course through American banks, cash registers and wallets. Conceivably individuals and businesses may refuse to accept euros bearing certain countries' printing codes, as one example of the tremendous payments disruption from EMU breakup (see also question 4).

Given the scarcity of foreign exchange, the authorities would introduce **capital controls** and possibly **multiple exchange rates** to limit and prioritize access to hard currency. These mechanisms will be familiar to those who operated in emerging markets in the 1980s and early 1990s, and even in Iceland following the 2008-09 financial crisis. Capital controls violate Article 63 of the Lisbon Treaty guaranteeing free capital movement, but that prohibition should prove little constraint since the country probably would have petitioned to withdraw from the EU already.

The new exchange rate probably would be **floating**, since the country's central bank would not have sufficient foreign exchange reserves to defend a parity rate (see also question 6).

4. What are the economic/financial costs and benefits of EMU exit?

Any country that leaves EMU regains **control of its monetary and exchange rate policy**. These benefits matter more for the periphery than the core given the former's loss of competitiveness since EMU entry (chart 1), less flexible labor markets and therefore lesser ability to undergo the internal devaluation (reduction in real wages) which Ireland and Latvia managed under a fixed exchange rate. Policy flexibility is less meaningful for core countries such as Germany, Austria and Finland given their wage restraint and resulting current account surpluses. For core countries, the primary benefit of a smaller Euro area would be avoiding the transfer payments between rich and poor regions which stabilize a diverse currency union. One potential form of such payments is the contingent liability Euro area members have assumed directly through EFSF guarantees, or indirectly through the ECB's bond purchases (the ECB is owned by the Euro area's member governments).

[3] For notes, designation include: Y Greece, X Germany, V Spain, U France, S Italy and M Portugal. The letter J has been allocated to the UK to account for the trivial odds that Britain ever joins the euro.

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While the nature of the costs from EMU exit vary considerably for core versus periphery countries, **negatives would be enormous for both camps.** Since a peripheral country would likely exit during a period of extreme market stress and fiscal disarray, costs would include: very high and even hyperinflation due to currency depreciation; high/higher bond yields due to risk premia for inflation and currency depreciation; sovereign and corporate defaults on euro-denominated debt; deposit flight from banks and capital flight from stock and bond markets to avoid forced redenomination; breakdown of payments system due to uncertainty over contract settlement; loss of capital market access for at least a decade; and potentially loss of privileges from EU membership (trade, investment, citizenship).

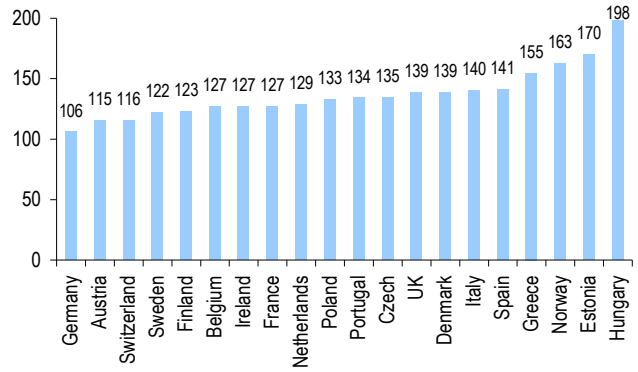
Spillover to the remaining EMU members is inevitable. Countries considered structurally similar to the exiting state – due to high debt levels or uncompetitiveness – would suffer **self-fulfilling runs** on their banks and capital markets from investors and corporates fearing that another country could exit or be expelled. Core countries would suffer massive wealth losses from corporate and/or sovereign defaults in the periphery, and cross-border commerce would collapse given uncertainty around contract settlement under new currency regimes.

The economic and financial impact for all of Europe would be **worse than Lehman**, which was only the most intense credit crunch in modern financial history. EMU breakup would combine that credit event with the collapse of Europe's payments and settlement system due to contract uncertainty. Given that modern economies subsist on credit and contracts, it should be clear that undoing EMU under most scenarios is the economic equivalent of mutually-assured destruction. The only scenario under which EMU can be unwound calmly might be if a country exited in several years after deficits had been eliminated and growth had been restored. Of course if stability returned, there would be no reason to exit other than nationalism or the desire to secure policy flexibility for the next crisis.

5. How would various types of contracts be settled?

Contract settlement under a euro breakup will depend on a number of factors, including the **governing law**, **currency of account or settlement** specified in documentation and the **nature of the breakup** (e.g., the euro continuing to exist despite the withdrawal of a single or multiple countries or the euro ceasing to exist).

Chart 1: Unit labor costs indexed to 1999 (EMU launch) equals 100
For example, Germany at 106 indicates that unit labor costs have increased by 6% cumulatively since 1999.



Source: OECD

Bonds are governed by domestic or foreign law, with most local currency debt (e.g., a Greek bond payable in euros) being governed by domestic law and external currency debt (e.g., an Italian bond payable in dollars) being governed by foreign law. Almost 99% of Euro area debt (sovereign and corporate) is issued in local currency.[4] These securities will be governed by local law and therefore exposed to redenomination risk since domestic law can be changed at will. Once a country declares another currency to be legal tender, foreign courts would in most cases recognize that a bond governed by the law of that country would then become payable in that currency.

Foreign currency debt – bonds issued by a Euro area country but payable in non-euro currency such as dollars, sterling or yen – are typically governed by foreign law (English or New York) over which the EMU state would not have jurisdiction. In general, foreign courts are unlikely to recognize the unilateral redenomination by a country exiting EMU of a bond governed by foreign law. Still, the bondholder would be exposed to significant default risk since corporates and the sovereign may not possess sufficient hard currency to honor bond payments.

Currency and interest rate derivatives are usually subject to an ISDA Master Agreement which is in most cases governed by English or New York law. If the euro continues to exist, transactions governed by such an ISDA Master Agreement between parties located outside the country exiting EMU should remain enforceable. Like cash bonds, currency and rate derivatives governed by foreign law are beyond the jurisdiction of local legislation so such

[4] The range on this figures runs from 92% in Finland to 100% for France, Germany, the Netherlands, Ireland and Portugal. 98% of Greece's debt is local currency, 97% of Italy's and 99% of Spain's.

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transactions cannot be legally redenominated into a successor currency. In practical terms, this insulation from redenomination risk may be irrelevant: if the country exiting EMU imposes exchange controls applicable to local parties to transactions governed by ISDA Master Agreements, a foreign counterparty may face delayed settlement or default risk. The ISDA Master Agreement includes termination events that address the right of the parties to terminate transactions if performance becomes illegal or impossible.

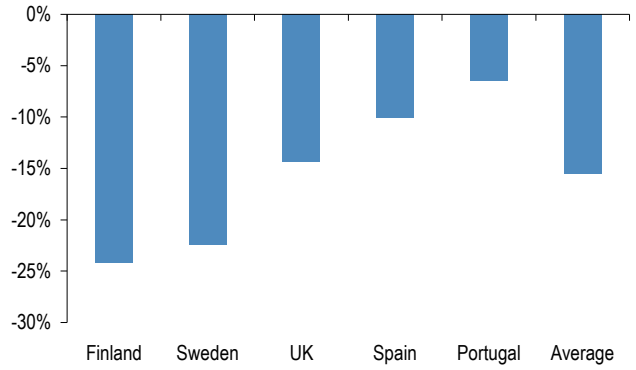
The above examples **assume the Euro continues to exist** as the legal currency for some large group of countries even assuming EMU breakup. If the euro ceased to exist, either because all 17 countries reverted to their legacy currency or because even the core split (see also question 2), the issue of the currency in which obligations will be payable becomes more complicated and will likely be determined upon the basis of factors peculiar to the particular transaction and may entail the application of the legal concept of *lex monetae* (i.e., the law of the country issuing the currency).

6. How would various currencies – the smaller euro, the successor currencies and the non-European currencies – move following EMU breakup?

Whether a large group of core countries exited or a weak country were expelled, **EUR/USD** would still collapse due to capital flight related to redenomination risk or the resulting economic depression. A 20% drop to 1.10 is a fair initial target reflecting several considerations: (1) previous regime shifts in Europe such as the ERM crisis delivered depreciations averaging 15% (chart 2); (2) a 1.10 level represents a 35% peak-to-trough move since the sovereign crisis began in 2009, so would be equivalent to peak-to-trough moves after a global financial crisis such as Lehman's bankruptcy; (3) institutional accounts are already record short of euros; and (4) the G-7 would undertake coordinated intervention to stabilize markets. Depreciations in emerging markets following de-pegging have been much larger at 60% on average (chart 3), but the nature of those crises was distinct from Europe's in that most EMs owed debts in foreign currencies. EMs also had limited ability to intervene in forex markets to stabilise their currencies, unlike the G-7's longstanding discomfort with excessive volatility.

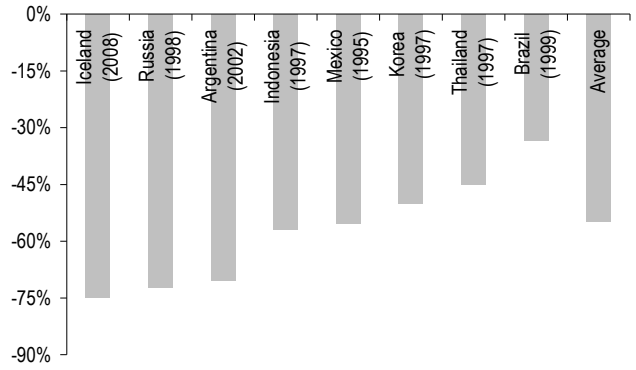
GBP/USD would probably fall half as much as the euro – implying that **EUR/GBP** declines about 10% – but sterling cannot act as a proper safe haven given that the UK will also experience a very deep recession. **EUR/JPY** could easily reach 85 because of general euro weakness, while **USD/JPY** probably remains within current range because

Chart 2. Currency depreciations vs deutschemark during the ERM crisis in 1992
% change in first year after currency pegs/managed floats were abandoned



Source: J.P.Morgan

Chart 3. Currency depreciations vs USD during emerging markets balance of payments crises
% change in first year after currency pegs/managed floats were abandoned. Year shown in parentheses.



Source: J.P.Morgan

both USD and JPY are likely to strengthen under such events. JPY could outperform USD because Japanese investors hold huge net-assets in the Euro area (¥50 trillion or €440 billion of bonds as of end-2010). Repatriation of such investment could push up the yen significantly and EUR/JPY may decline as low as 80. In this scenario, USD/JPY will fall to 72. Concerted intervention by G-7 countries can be expected in both EUR/USD and EUR/JPY, but is unlikely in USD/JPY.

Successor currencies in weak states exiting EMU would probably decline at least 50% versus the euro. This move would reverse their loss of competitiveness due to excessive wage growth relative to Germany since EMU's launch in 1999 (chart 1). It would also approximate the average depreciation witnessed during emerging markets balance of payments crises over the past twenty years (chart 3).

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The Swiss National Bank would probably abandon the **EUR/CHF** 1.20 floor for two reasons. First, inflows into Switzerland would be massive and the SNB may not want to continue accumulating reserves in a currency like the euro that was disintegrating. Second, the SNB may not want to anchor its exchange rate to something as volatile as the euro would be during a breakup. A EUR/CHF decline to at least 1.10 or 1.05 is likely. Africa's **CFA franc** zone, which pegs to the euro, would face similar questions: remain tethered to a high-volatility currency in crisis, or re-peg to some other currency (USD) or a basket of currencies.

Commodity currencies, Scandinavia and the emerging markets (ex managed currencies such as CNY) would fall at least as much against the dollar as the euro would, given the global recession which would result from EMU breakup. The superior fiscal fundamentals of those countries would be irrelevant for the first few months of the crisis since they would experience massive capital outflows (investors are still long these currencies outright or through bond/equity exposure) or reductions in the their trade surpluses. As a reference point, note that these currencies exhibited a beta of roughly 1.2 to EUR/USD following Lehman's collapse and during 2011 deleveraging, suggesting they should fall against the dollar by 1.2 times the EUR/USD move. Intervention is very likely, but only after an initial collapse.

7. Are there any relevant historical precedents for what EMU might experience if the union dissolves?

Over the past century at least a half dozen currency unions have dissolved, but almost all of these relate to the breakup of empires with undeveloped capital markets rather than a highly-integrated trade and investment bloc such as Europe. Between 1992 and 1993 the ruble zone disintegrated progressively following the **Soviet Union's** breakup in 1991, as newly-independent states introduced national currencies. Similarly when **Yugoslavia** split into several sovereign states in the early 1990s, Slovenia replaced the dinar with the tolar in 1991 before joining the euro in 2007. Croatia introduced the kuna in 1994. In 1993 the **Czechoslovak** koruna was split into the Czech koruna and Slovak koruna before Slovakia joined the euro in 2009.

Pre-World War II dissolutions include the **Austro-Hungarian Monetary Union** which was formed in 1878 and dissolved into several regional currencies in 1919 when the empire fell after World War I. The **Latin Monetary Union** comprising mainly France, Belgium, Italy, Spain and Switzerland was formed in 1865 and dissolved formally in 1927, another victim of interwar financial turmoil. While interesting historically and perhaps for the mechanics of introducing new notes and coins, none of these examples foreshadow the economic disruption Europe would experience from EMU breakup. Cross-border trade, investment and banking are much more extensive within EMU than in former communist states or 19th and early 20th century Europe.

8. What are the odds of various scenarios over the next year?

Given that an EMU downsizing involves mutually-assured economic depression for the region, the **odds of countries leaving or being expelled are low.** Of the two breakup scenarios – exit/expulsion of weak country versus withdrawal of a critical mass of strong countries – exit of the weak is more likely at 10% to 20%. Generalized breakup has odds of less than 5%.

Speculation of EMU breakup could rise materially this spring, however, since Greece will almost certainly undergo another round of debt restructuring after February 2012 elections. Should Greece unilaterally renege on debt owed to its official (government) creditors – €110bn pledged by the EU/IMF of which €65bn has been disbursed – the country could be considered in breach of the solidarity owed the Union under the Lisbon Treaty (see question 1). Although it is unclear whether solidarity principles would be sufficient legally to eject a country, political pressure to expel would be immense, in turn driving unpredictable amounts of capital flight and hedging as investors and corporates rethink the convertibility risk inherent in European exposure. Note that a further write-down of privately-held debt would not trigger calls for expulsion since Euro area governments condone haircuts on private sector creditors.

9. What reasonable measures should corporates and investors undertake given the risks?

If EMU breakup were a very likely event, then so would be a European depression, a global recession and possibly a global depression. How to manage currency risks – whether from redenomination or sharp moves – is one of several questions which should also include how to manage other inevitabilities such as earnings risk, cash and liquidity risk. For **investors**, the extreme response includes being overweight cash relative to risky assets and to hedge all exposure in currencies other than USD and JPY, which will appreciate in the event of EMU breakup.

For **corporates**, the extreme response would be to hold sufficient cash to meet a year of liabilities in the event that capital markets shut, and to be particularly focused on hedging all Euro area-based non-USD or JPY receivables. Consideration should also be given to hedging a greater percentage and longer maturities of forecasted exposure as part of a **rolling and layering** strategy. In terms of tenor, at a minimum investors and corporates should hedge

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EUR/USD and EUR/JPY exposure with a one-year horizon, given that sovereign stress will persist for at least this long (a longer horizon may be warranted depending on confidence in the forecast). Finally, corporates should consider protecting the USD value of non-USD cash as part of a **net investment hedge** strategy. Potentially these responses could be impractical given the opportunity costs of holding excess cash and the hedging costs of higher-yielding markets. Question 10 examines the cost-effectiveness of hedges from current levels of volatility and skew.

This focus on hedging the long EUR currency risks leads to the question regarding the measures to take with short EUR positions. For corporates in particular, some form of hedging is prudent in all scenarios, given the high degree of uncertainty in FX markets at all times, much less during this sovereign crisis. However, hedges in this direction should be adjusted by hedging a smaller percentage within defined rolling and layering bands and considering the use of options versus forwards. Use of options (see question 10) can reduce the potential negative settlement impact of forwards and provide flexibility in the context of competitive risk.

10. What are the most efficient hedges given current volatility and skew across currencies?

Hedging EMU risk has been an recurring focus of recommendations published in *FX Markets Weekly* – depending on the policy outlook – and was revived in the year-ahead outlook published last month (see *Global FX Strategy 2012*, November 22, 2011). Given renewed client interest in the tail risk but also significant moves in spot, volatility and skews recently, this section provides a framework for choosing amongst direct and proxy trades.

The selection of hedges must begin with a shortlist of potential underlyings in which to buy options. This is not so much an issue for corporates as it is for institutional investors: the former are more or less restricted to the EUR-cross against their home/accounting currency (EUR/USD for US firms etc), while the latter are unconstrained by geography and free to select from among a wider array of proxy currencies that are likely to perform in a Europe-driven meltdown. We detail our hedge selections for corporates and investors below for the euro as well as proxy currencies. The possibility that the euro may not exist argues for broadening hedges beyond the pair in which accounts have direct exposure.

A. Corporates

In general, extreme (tail) hedging constructs are well advised to steer clear of complex option structures that are illiquid and could be difficult to unwind amid heightened market volatility, particularly for corporate hedgers who operate under accounting constraints. As a result, we restrict the set of investable structures to single-strike vanilla options that comprise the lion's share of option-based corporate hedges in normal environments, and focus on optimizing the selection of option parameters that deliver the best risk-reward. The generic approach to hedge selection takes into account three variables:

- **Valuations**: It is preferable to own options that are priced historically cheap over those that are historically expensive. We measure historical rich/cheap through the 2-yr z-score of option premia (number of standard deviations that the current option premium is above its 2-yr mean). Working with option premia directly (as opposed to volatility for example) has the advantage of taking into account spot location, forward points, levels of base vols and risk-reversals simultaneously and obviates the need for analyzing each pricing element individually.
- **Static carry**: Carry is a catch-all for the P/L that accrues to any investment due to the passage of time. For options, carry is a combination of option time-decay, slide along the forward curve, and slide along the vol surface as time to expiry shrinks. Owning options usually involves paying away carry primarily through time-decay – especially for shorter-dated options – for the right to benefit from a substantial move in the underlying exchange rate; smaller the negative carry costs, the more attractive the option. We measure carry of an option by shrinking its time to maturity by three months (an arbitrary time horizon) and recording the change in premium, holding spot, forward curves and vol surfaces constant.
- **Projected P/Ls in large spot moves**: This is the core of the issue and not trivial to gauge. A 10% move in spot delivers 10% returns for a cash hedge (before rate differential effects); for an option viewed prior to expiry that benefits not merely due to the change in the underlying spot but also due to the surge in volatility, the effect is harder to quantify. It requires a forecast of vol moves in response to a given spot move, which involves subjective judgment. An alternative is to rely on the risk-reversal (or "skew") which captures the option markets' prediction of spot and vol co-movement. In reality, large market moves often result in vol explosions that significantly exceed skew predictions, hence using the latter results in conservative estimates of P/L for option owners. We compute projected P/Ls for all options under the assumption of an instantaneous 15% shock to EUR/USD spot as discussed under #6.

Table 1 illustrates this framework with the example of EUR/USD. For each strike/tenor combination, we record

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the three variables discussed above, and highlight points on the vol surface that provide their optimal combination (assigning equal importance to each). The first observation from the table is that there is no free lunch: the most efficient hedges are more expensive upfront, yet offer the best risk-reward in the end. For example, 6M 1.35 EUR puts/USD calls offer the best cost-benefit in terms of the upfront payment vis-à-vis the rate of price decay if markets stay flat (i.e. 30%) and the potential return if spot collapses. In contrast, lower strikes potentially pay out significantly more as a fraction of the premium paid, but also decay faster – for instance, 6M 1.00s losing 86% of their value in unchanged markets over a 3-month horizon. Second, for most tenors, close-to-ATM strikes offer better value, since EUR put buying over the past year has already pushed up the prices of deep out-of-the-money strikes to extremely elevated levels (chart 4). Choosing between tenors is a trickier task since it partly depends on the conviction of one's views on how quickly the EMU might unravel. We typically advocate 1-year options that provide a decent mix of market liquidity and some of the more aggressive P/L characteristics of shorter dated options.

Table 2 repeats the same exercise for EUR/JPY, EUR/AUD and EUR/GBP to address hedging concerns of Japanese, Australian and UK corporates respectively, summarizing only the optimal 1-year strikes for each in the interest of conciseness (detailed tables similar to table 1 available on request). We assume that a catastrophic drop in the EUR leads to sympathetic declines in EUR/JPY and EUR/GBP (i.e. options are struck in the direction of EUR puts), while EUR/AUD rallies due to the high-beta nature of AUD (i.e. option are struck for EUR calls/AUD puts). Of the four, EUR/JPY options are clearly the most historically expensive (z-score = 1.4), while EUR/GBP and EUR/AUD options are cheaper and struck furthest out-of-the-money on account of lower base vols and risk-reversals vis-à-vis EUR/USD.

Overall, we recommend that corporates stick to their ongoing rolling and layering hedging programs as the best defense against volatility in currency exposures. However in a scenario where the forecasted foreign revenue stream is less certain, options are the preferred instrument to hedge against declines in realized exposure.

B. Investors

The framework for hedge selection for investors is similar to the one above, except that the choice of underlying currencies is wider. Following the arguments in Table 1, we run through optimal strike selections for a number of tenors across not only the four EUR-crosses mentioned earlier, but also a number of USD/high-beta currencies such as AUD, USD/JPY, BRL, MXN and KRW that have proven track records of imploding in meltdowns.

Table 1. Close-to-ATM strikes in EUR/USD offer better trade-off between valuations, carrying costs and returns from a dramatic collapse in spot compared to deep OTM options….

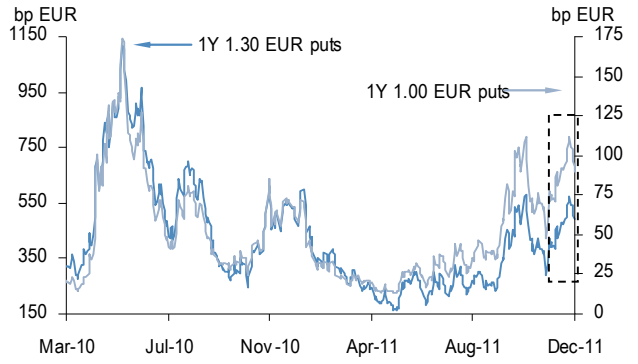
For any strike/tenor combination, the first number is the 2-year z-score of option premium (# of std. deviations current option prices are above their 2-yr mean), the second number is the 3-month price carry as a fraction of upfront premium and the third number denotes the P/L from an instantaneous 15% spot shock lower as a fraction of upfront premium. Carry is estimated by ageing options by 3-months, holding spot, forwards and the vol surface unchanged, while directional P/L is computed by shocking spot *instantaneously* 15% lower, assuming vols to move as predicted by current risk-reversals. Strike/tenor combinations for each tenor that provide the optimal combination of the three variables are highlighted in gray.

	EUR Put / USD Call Strikes								
	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40
6M	0.9	0.8	0.7	0.6	0.4	0.3	0.2	0.1	0.1
	-86%	-81%	-75%	-68%	-60%	-51%	-41%	-30%	-18%
	675%	632%	595%	559%	515%	459%	393%	323%	256%
1Y	1.2	1.0	0.9	0.7	0.6	0.5	0.3	0.2	0.1
	-36%	-33%	-29%	-26%	-23%	-20%	-16%	-13%	-9%
	293%	290%	287%	281%	271%	255%	235%	212%	187%
2Y	1.3	1.2	1.0	0.9	0.8	0.6	0.5	0.4	0.3
	-13%	-12%	-11%	-10%	-9%	-8%	-7%	-6%	-5%
	182%	180%	178%	174%	169%	162%	153%	144%	135%
3Y	1.5	1.4	1.2	1.1	1.0	0.8	0.7	0.6	0.5
	-7%	-7%	-6%	-6%	-5%	-5%	-4%	-4%	-3%
	146%	143%	141%	137%	133%	128%	123%	117%	111%
4Y	1.7	1.6	1.4	1.3	1.2	1.1	0.9	0.8	0.7
	-4%	-4%	-4%	-3%	-3%	-3%	-2%	-2%	-2%
	127%	125%	122%	119%	116%	111%	107%	103%	98%
5Y	1.8	1.7	1.6	1.5	1.4	1.2	1.1	1.0	0.9
	-2%	-2%	-2%	-2%	-2%	-1%	-1%	-1%	-1%
	117%	115%	112%	109%	106%	102%	98%	95%	91%

Source: J.P.Morgan

Chart 4. …as demand for disaster protection has pushed up prices of deep OTM EUR puts/USD calls disproportionately higher

Premium (in bp EUR) of 1Y 1.30 strike and 1Y 1.00 strike EUR puts/USD calls



Source: J.P.Morgan

Table 2. Strike selections in EUR-crosses for US, Japanese, Australian and UK corporates: EUR/GBP and EUR/AUD offer value

Currency Pair	Option Type	Option Tenor	Option Strike	2-yr Z-[Option Premium]	3-mo carry/ premium ratio	P/L in a 15% EUR spot shock / premium ratio
EUR/USD	EUR put	1Y	1.35	0.1	-30%	323%
EUR/JPY	EUR put	1Y	95.00	1.4	-23%	231%
EUR/AUD	EUR call	1Y	1.50	-1.1	-32%	238%
EUR/GBP	EUR put	1Y	0.81	0.3	-22%	420%

Source: J.P.Morgan

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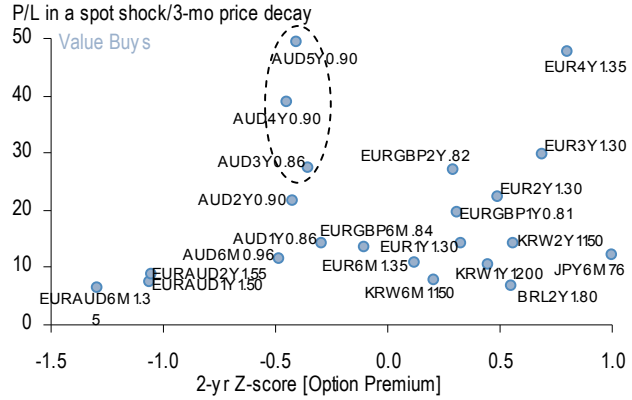
Chart 5 maps those selections along two dimensions of value – the horizontal axis ranks options by the historical rich/cheap of their premia (2Y z-score), while the Y-axis plots the ratio of the P/L under a spot shock to the 3-month carrying cost (or price decay). Value buys lie in the upper left quadrant where time-series cheapness meets impressive hedge performance. A key assumption of the graphic is that a 15% shock to EUR/USD perturbs other currencies by empirical betas observed during market downturns – these are usually of the order of 1.2 -1.3 for the currencies considered, except USD/JPY that has tended to demonstrate markedly lower sensitivity to risk recently.

The key takeaway from chart 5 is the value in longer-dated AUD puts – most obviously in AUD/USD 3Y-5Y 86-90 strikes, but also in 1Y-2Y 1.5-1.55 strike EUR calls/AUD puts – that outstrips that offered by EUR/USD options. This is not surprising, and only confirms the relative value vol arguments we have made in favor of back-end AUD vols relative to EUR in recent publications (see *FX Markets Weekly*, December 2, 2011). In contrast, EM options (BRL, MXN) are off-the-charts expensive and conspicuously absent from the graphic. That is not to say that owning them will not pay off in stress, only that their valuations are too rich and carrying costs too high to deliver the asymmetry desirable in defensive longs.

Chart 5. Longer-dated AUD puts offer value as disaster hedges
X-axis denotes historical rich/cheap of option prices in terms of the 2-yr z-score of option premia; Y-axis denotes risk-reward as P/L in a 15% EUR-collapse/3-month static price decay. Spot shock to non-EUR/USD underlyings scaled by their beta to EUR/USD. X-axis truncated to leave out expensive options. No transaction costs



Source: J.P.Morgan

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