When Smart Money is Borrowed Money*

Elmar Mertens †

October 2002

Shleifer, Andrei, and Robert W. Vishny. 1997. "The Limits of Arbitrage". *The Journal of Finance* 52 (1): 35–55 (March).
Kyle, Albert S., and Wei Xiong. 2001. "Contagion as a Wealth Effect". *The Journal of Finance* 56 (4): 1401–1440 (August).

A central tent of financial theory is the idea that prices should reflect fundamental value, a.k.a. the Efficient Market Hypothesis (EMH). Going back to Friedman (1953) and Fama (1965), the key argument to make this idea work in the presence of irrational investors is "smart money": Rational investors who would not only undo any prices set by irrational investors but who would also profit from this when prices converge back to their fundamental value.

Typical candidates for this role are professional investors. Among others the word "professional" means that they are usually investing other people's money. Whilst such a "separation of brains and [capital]"[1] might be convenient it creates asymmetric information. A key insight of the two papers I will discuss below is that under asymmetric information the ability to invest (i.e. funding) might be severely hampered at the very moment when investment opportunities (i.e. expected returns) are extraordinarily good. This kind of story highlights an important element in explaining cases like the collapse of LTCM in 1998 or the crisis of Martin Ebner's Visionen this year.

By the standards of this series, the first paper is almost of vintage quality: The work of Shleifer and Vishny dates back to 1997. It has been credited by The ECONOMIST (1998) to be the "[o]nly . . . academic paper . . . close to explaining [the events at LTCM]" – quite remarkable given that it has been written before the fact. The second paper is the study of Kyle and Xiong (2001) which extends the intuition of Shleifer and Vishny to questions of financial contagion by appealing explicitly to the events surrounding the LTCM debacle.

Building on the same kind of idea, both papers belong to different strands of the academic literature: Shleifer and Vishny developed their model as part of

*Forthcoming FMPM 2002

†For correspondence: Elmar Mertens, University of Basel, Wirtschaftswissenschaftliches Zentrum (WWZ), Department of Finance, Holbeinstrasse 12, 4051 Basel, Phone +41 (61) 267 3309, email elmar.mertens@unibas.ch

the research program in behavioral finance. Their goal is to highlight that Friedman's story of "smart money" ensuring rational pricing breaks down in a more realistic setting where arbitrage is risky and fund managers depend on external investors. This result is intended to open the door for behavioral explanations of patterns in asset prices.

The important thing to note however is that even though their paper belongs to "[o]ne of the biggest successes in behavioral finance" (Barberis and Thaler 2002, p. 4) there is nothing behavioral to their story in the sense of any psychological effects being at work[2]. Their result is only the foundation why behavioral effects might matter *in subsequent models*. Indeed, while Kyle and Xiong build on the story of Shleifer and Vishny, they offer a rational explanation for a topic which has otherwise been easily ascribed to investor irrationality: Financial contagion. Specifically, they show how it can be entirely rational for asset prices in markets with uncorrelated fundamentals to be correlated. In their model, markets are not linked by fundamental risk but by endogenous risks arising from the rational trading strategies of smart investors.

The Limits of Arbitrage

Shleifer and Vishny (1997) were not the first to show that the presence of noise traders can distort prices – contrary to the idea of Friedman (1953). The original EMH argument hinges on the proposition that mispricings offer *riskless* profit opportunities (arbitrage in the academic meaning of the word[3]). Indeed, there is wide unanimity among financial researchers that riskless profit opportunities will be arbitraged away rather quickly. More contestable is the idea that a divergence in prices from fundamental value offers such an opportunity. For instance there might be no perfect substitute available to eliminate fundamental risk, not to speak of uncertainties in modelling "fundamental value". And once noise traders have impacted on prices, why shouldn't they drive prices further away for *some* time? I such a setting, smart managers recognize that trading against noise traders might be profitable but will definitely be risky, too. In particular the indefinite nature of noise traders' swings in opinion makes markets unattractive for short-term oriented investors. In their seminal contribution, De Long et al. (1990) show how noise traders create systemic risk by their very trading activities – risk which leads to less aggressive trading of rational investors.

What is new about the model of Shleifer and Vishny is that they add informational asymmetries between money managers and their investors to this framework. For a large part, professional money managers are entrusted with the money of outside investors. These investors have often only a limited understanding of the strategies pursued by the managers – partly because they do not want to know[4] and partly because the manager does not want them to know. Still they have to infer a manager's ability and a common way to do this is by looking at his track record.

This leads to a situation where funding of investment strategies is determined by their past performance and not by their expected returns. The responsiveness of funding to past performance imposes also a time horizon and risk aversion to money managers. Messrs Shleifer

and Vishny have dubbed this setting "Performance Based Arbitrage" (PBA). Of course, fund managers try to alleviate short-term dependencies by lock-ups and the like. But in particular leverage (borrowing where the portfolio value serves as collateral) can at times of severe downturns (namely those where the portfolio's collateral value hits the amount of borrowing) lead to very instantaneous responses in funding: The very situations encountered by LTCM[5] and Martin Ebner in Switzerland.

In order to demonstrate this analytically, Shleifer and Vishny set up a two-period model where money managers need to anticipate the adverse effects of noise trader shocks to their funding ability in the second period before uncertainty is resolved at the end[6]. Again the central result bears out some irony concerning the business conditions of money managers under asymmetric information: Severe drops in prices lead on the hand to a bad track record and low funding as well as to high expected returns on the other hand. Funding for (risk) arbitrage is particular hard to obtain at times when expected profits are the most promising. It is the lack of funding for spread trading which can extend mispricing even further – in particular as long as noise traders' opinion does not swing back. As Shleifer and Vishny point out themselves: This might appear perverse but is an entirely rational response in their setting.

Even though the PBA model looks plausible, the question remains how significant its effects are in reality. Most likely they will be felt in extreme markets, and that is the kind of situation that our second paper is interested in.

Contagion as Wealth Effect

The core theme of Kyle and Xiong (2001) is that financial risks do not only arise from asset fundamentals but also from the actions of traders and investors. This theme was already central to the work of De Long et al. (1990) where noise trader create systematic risk driving out rational investors and leading to persistent mispricing.

Kyle and Xiong however focus on how the strategies of convergence traders (that is how they call rational money managers) work as a source of such *endogenous risks*[7]. In particular how they lead to the amplification and transmission of shocks across markets during financial crises as in the autumn of 1998 (Russia's default and the LTCM collapse).

Kyle and Xiong describe the stylized facts as follows: Huge losses at financial intermediaries as prices move against them, simultaneous decrease of depth and liquidity across markets, simultaneous increase of markets' volatilities and increasing correlations of asset classes which would appear fundamentally independent. A key difference in the spirit of their paper to the models of Shleifer and Vishny (1997) or De Long et al. is that they offer a perfectly rational explanation for these patterns without resorting to behavioral stories (like irrational panic spreading across markets).

The PBA approach of Shleifer and Vishny shows up in their model as the assumption that convergence traders receive no capital inflows – they have to get along with their initial endowments. Hence the wealth constraint plays now the role of outside investors determining funding based on past performance. Convergence traders are modelled with de-

creasing absolute risk aversion[8] so that they are infinitely risk averse at levels of wealth near zero[9] and risk-neutral at infinite amounts of wealth. Their wealth determines their aggressiveness of trading and is one of two state variables in the model. Low wealth is the result of bad performance and leads to scaled down investments as in the model of Shleifer and Vishny.

The new element of Kyle and Xiong's model is that investors trade in several markets and losses in one market will lead to decreased positions – at the extreme: fire sales – in all markets. That is the transmission and amplification mechanism in their model.

The model itself consists of two markets and three types of agents: Fundamentals of the assets traded in each market are not correlated. Noise traders act only in one market, their activity is the second state variable describing equilibrium (in both markets). The other agents are the convergence traders discussed above and "long term investors". Both trade across markets.

While convergence traders account both for their limited wealth *and* noise trader shocks, long-term investors trade solely on spreads between fundamental value and market prices disregarding short-term considerations arising from noise trading[10] and without any wealth effects. Colloquially speaking: Convergence traders are hedge funds of the LTCM kind while the long-term investors are more like Warren Buffet, having deep pockets. They are important in the model as providing liquidity when convergence traders do not want to trade anymore because their wealth is close to zero. However, they do not provide infinite liquidity[11].

Among others, this setup exposes the following issues: Can noise trading have any influence in the presence of long-term traders (who do not suffer from wealth constraints)? Could noise trader shocks possibly impact prices in the noise-trader free market? Solving the model shows that in both cases the answer is "yes". I have already described how convergence traders' wealth effects will amplify and transmit shocks in and across markets. The important point to see is that long-term investors do not swallow the combined effects of noise traders and convergence trader's wealth responses – at least not at the numerical values used by Kyle and Xiong. This is confirmed by the anecdotal evidence of the LTCM crisis when not even Warren Buffet was prepared to ride out the storm in their portfolio.

The results of Kyle and Xiong are *not* driven by asset fundamentals but by *endogenous risks*. Their results can be summarized as functions of two state variables, describing the actions of agents: Convergence traders' wealth and noise trader shocks[12]. A necessary condition for prices to deviate from the case of fundamental values and zero market correlations is that noise trading should be large. However, profit opportunities are also a function of the convergence traders' risk bearing: When wealth is large, they drive prices to fundamental value and expected Sharpe Ratios go to zero. The most promising investment opportunities arise at low levels of wealth. Again, this is the perverse nature of money managers' business conditions when funding is a function of past performance.

The other feature of the model is the amplification and transmission of shocks

via the wealth effect. Again, large noise trading is a necessary condition for anything of interest to happen. In order for the wealth effect to impact on markets, the exposure of convergence traders should be sizeable. Hence it is at intermediate levels of wealth[13] when the amplification of shocks and the – purely non-fundamental – correlation of markets occurs. This is the kind of crisis situation Kyle and Xiong set out to explain with their model.

Notes

[1]Shleifer and Vishny (1997, p. 36)

[2]Their model features noise traders as do Kyle and Xiong (2001). But there is a subtle difference between behavioral agents and noise traders. The former follow some (at best persistent) pattern of actions related to some psychological theory while the latter's action are just "noise" without any discernable pattern.

[3]To be really rigorous on this: Arbitrage should not be exposed to any downside risks. Variation among purely non-negative payoffs would be harmless – like a lottery ticket which did not cost anything.

[4]Please remember that there is some reason why people seek a division of labor between capital and brains.

[5]Whose situation was among others being exacerbated by front-running, a feature taken up by Kyle and Xiong (2001).

[6]Hence prices are assured to trade at fundamental value in the final period but not at intermediate stages. Investors choose to fund strategies in a Bayesian fashion where the period one performance is used to update a prior belief in the managers abilities.

[7]In a way, endogenous risks stem from the actions of *all* market participants. However from a modelling perspective, there is a clear distinction between the noise traders as source of systematic risk in the model of De Long et al. (1990) and convergence traders' wealth effects – to be discussed below – of Kyle and Xiong (2001).

[8]They maximize an additively separable logarithmic utility function over an infinite horizon.

[9]Implying that they will not allow their wealth to become negative.

[10]There is a fine point to be made about the rationality of the agents in the model: By neglecting trading opportunities from noise trader risk, the long-term strategy is profitable but not optimal. Such a strategy is not fully rational, but neither it would qualify as being behavioral. It could be rationalized as being robust to misspecification of the noise trading process.

[11]In their numerical illustration, Kyle and Xiong specify that their demand to assets in the market with noise traders is four times as sensitive as in the other market.

[12]Extent and direction of their random trading impulses.

[13]In addition to large noise trading.

References

Barberis, Nicholas, and Richard H. Thaler. 2002, September. "A Survey of Behavioral Finance." NBER Working Paper W9222, Forthcoming in the Handbook of Economics and Finance, edited by George Constatinides, Milton Harris and Rene Stulz.

De Long, Bradford J., Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann. 1990. "Noise Trader Risk in Financial Markets." *The Journal of Political Economy* 98 (4): 703–738 (August).

Fama, Eugene F. 1965. "The Behavior of Stock-Market Prices." *The Journal of Business* 38 (1): 34–105 (January).

Friedman, Milton. 1953. The Case for Flexible Exchange Rates. Essays in Positive Economics, Chicago: University of Chicago Press.

Kyle, Albert S., and Wei Xiong. 2001. "Contagion as a Wealth Effect." *The*

Journal of Finance 56 (4): 1401–1440 (August).

Shleifer, Andrei, and Robert W. Vishny. 1997. “The Limits of Arbitrage.” *The Journal of Finance* 52 (1): 35–55 (March).

The ECONOMIST. 1998. The unbearable lightness of finance. December 3rd.